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A. PRESCOTT FOLWELL, EDITOR

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CONTENTS

Designing for the Future 1
A Municipal Index 2
Review of Municipal Work 2
Street Lighting During the Year. By Alton D. Adams 4
Chert Roads in Alabama (Illustrated) 6
The Year's Construction Work 7
Valuation of Franchises. By William D. Marks 8
Reinforced Concrete Standpipe (Illustrated) 10
Prices of Materials in 1906 11
Relative Cost of Cleaning Various Pavements 11
Refuse Destructor 11
In Favor of Tar Sidewalks 11
Correspondence 12
News of the Municipalities 13
Modern Insurance Engineering. By George E. Walsh 17
Fire Protection for Small Towns 19
Sewage Treatment at Worcester (Illustrated) 20
Referendum and Initiative 22
The Disposal of Municipal Waste. By W. F. Morse 23
Elastic Roadbed of Tarred Gravel 27
REVIEW OF THE PERIODICALS
- Reinforced Concrete Paving in Denver (Illustrated) 28
- English Septic Tanks and Sprinkling Filters 28
- Algae Deoxidize Water 28
- Milk Supplies in Cities 29
- The Five-Hundred-Mile City 29
- Playgrounds 29
- Use of Chicago's Small Parks 29
- River Front Improvement for Albany 29
- Back to the Land 29

The Municipal Index 30
Book Reviews 33
Who's Who in Municipal Work 33
THE WEEK'S CONTRACT NEWS
- Bids Asked For 34
- Street Improvements 35
- Sewerage 36
- Water Supply 36
- Lighting and Electricity 37
- Fire Equipment and Supplies 37
- Public Buildings 37
- Street Railways 38
- Bridges 38
- Miscellaneous 38

Patent Claims 38
Legal News—A Summary and Notes of Recent Decisions 39
News of the Societies 39
Personals 40
A Paving and Building Block Plant 40
Street Car Fender (Illustrated) 41
Dumping and Spreading Wagon (Illustrated) 41

Designing for the Future

THE writer had occasion some time ago to review and revise plans for a water supply, in which he found that provision had been made for a single feeding main which would be of sufficient capacity for certainly fifty years to come; while one ample for the next twenty years would have cost two-thirds as much, and if the remaining third were placed at 4 per cent. interest it would, at the end of the twenty years, have amounted to sufficient to lay another line bringing the capacity up to that originally planned. These facts alone point to no superiority in the latter plan, but—and this is the idea it is desired to emphasize—it allowed for fallibility in prevision of future conditions. It would, for instance, be quite possible that the predicted growth in population would not occur; or that it would take an unforeseen direction, in which case the second line could to advantage be laid in a more direct route than the original one which had been planned.

The above case is referred to not because of its importance, but as an illustration of a general principle—that it is possible to attempt to make definite provisions for too distant a future in planning municipal utilities. For not only are predictions liable to error, but it is probable that in most branches improvements will be made which will in many cases cause true economy to be served by discarding old appliances long before they are worn out. A pump, for instance, which was purchased ten years ago, and of a capacity sufficient for ten years to come, may now be found to be of such comparatively low efficiency that it seems desirable to substitute a high duty one for it, even before the demand upon it has reached its most economical capacity. It is not claimed that no provision for the future should be made; but that this should be flexible, permitting advantage to be taken of improvements which may be devised meantime. In designing a boiler house, for instance, it would be foolish to build at the outset foundations for future installments of a certain style of boiler; or even possibly to leave space in the building for them; but sufficient land should be purchased for any possible extensions, and the building and plant so arranged as to permit of readily adding them. On the other hand, since a concrete pavement foundation will serve for any kind of wearing surface now used within present probabilities, such foundation should be constructed, and should be as durable as possible. It is well, in fact, in all undertakings to have in mind future needs, as well as those of the present.

A Municipal Index

READERS of the MUNICIPAL JOURNAL AND ENGINEER will notice at least one important change in this number in the matter prepared for them. A municipal index is a feature which we have for some time believed would be appreciated by many, and it is our intention in the future to present in the first number of each month an index of all articles relating to municipal utilities and government which have appeared in the periodicals published during the previous month in the United States, as well as a few foreign ones. We believe this is the first attempt at just such an index, although there are indexes of popular magazines, of scientific periodicals, of sociological matters and others. While the list of periodicals reviewed this month is fairly complete, a coincidence of adverse circumstances has prevented the index this month being all that we desire, and we confidently promise that future installments will show great improvements over this one. For reviewing the non-technical matter we have secured the services of Mr. Charles Mulford Robinson, whose writings on subjects connected with municipal beautifying are so well and favorably known. Through this index, combined with more extended reviews of the most important articles, and of the latest books as they appear, our readers will be kept in touch with all that is published in our particular field.

As a result of our own conclusions, strengthened by the request of many subscribers, we have changed the manner of presenting the Municipal News; believing that the great mass of informative news contained in those columns will be of more value to all if arranged according to the subjects referred to therein.

REVIEW OF MUNICIPAL WORK

Report of the Committee on Review of American Society of Municipal Improvements—Work Done in Forty-six Cities

YOUR Committee on Review have endeavored to collect data from every city in the United States relative to the work done during the year ending between January 1 and August 1, 1906, Mr. T. D. Allin taking the Pacific coast, and the Chairman the remainder of the country. The results obtained by the former are detailed in a separate accompanying report. The Chairman sent requests to the 350 largest cities in his division for reports for the year 1905, and received 56 replies thereto. Annual reports were received from 47 (the City Engineer of Springfield, O., took the pains to make up a most neat and tasty typewritten report, as none were printed); and data from 46 of these are given in the accompanying table. In a considerable number of these reports all the desired data were not given, and could not be calculated from any statements contained therein. One report from a city of about 25,000 population in northern New York furnished not a single item covered by this table, although it contained alleged reports from every department of the city government in a pamphlet of 132 pages; even when the City Engineer's report was examined as a last resource—and the reports of the engineers were generally found to contain more meat than any others—it yielded ten pages of the names of streets on which sidewalk grades had been given, two pages of lists of other miscellaneous work which the Engineer had done, and absolutely nothing else; except for the reports of the Departments of Education and of Fire, this is the poorest municipal report we have ever received.

One fact brought forcibly to our attention was the delay in publishing the reports of most cities. Few municipal reports are published sooner than six months after the termination of the period to which they refer, and in some cases eighteen months has elapsed before they appeared. One city had had all the matter in the printer's hands for six months, except the Mayor's report, and that has not been written yet. The value of reports would be increased several hundred per cent. if they could reach the citizens within ninety days of the end of the year which they cover. Too many reports give no data except in terms of dollars and cents. That a given amount has been spent for paving has a certain interest, but this would be increased many-fold if the amount and kind of paving obtained for it were stated also.

The most complete reports are almost invariably those of the water departments. (Where no reports concerning the water supply are given in the table the supply is by a private company.) It is probable that this is because of the persistent work done towards obtaining uniform reports in this department. We believe that this society could do no work more valuable than effecting uniformity and completeness in municipal reports. One effect of this would be the keeping by departments of the records necessary for furnishing these data. Incredible as it may seem to some, there are lighting departments which have no records of the numbers of street lamps in their city; water departments which do not know the number of fire hydrants, miles of mains, or even the number of service connections on their system; and numbers of sewer departments have no records, even approximate, of the numbers of house connections, to say nothing of their locations.

Several cities publish no reports at all. Some feel too poor to do so; but this can hardly be said of all, notably of two of more than 100,000 population each. In fact, an official of one of these writes that for several years the publication of municipal reports of public works has been prevented "through the efforts of contractors and others in this field." Perhaps no stronger argument than this could be offered for the prompt publication of complete data concerning all municipal expenditures.

We hope the committee on Municipal Data and Statistics will energetically push this matter of municipal reports next year, and the present members of this committee will do all in their power to assist them, as will also, we are confident, the members for the coming year.

The report was submitted by A. Prescott Folwell, as Chairman of the Committee, at the recent convention at Birmingham, Ala.

WORK DONE BY VARIOUS MUNICIPALITIES DURING THE YEAR ENDING ON OR AFTER DECEMBER 31, 1905.

DATA DERIVED FROM MUNICIPAL REPORTS.

Name of City	Method of Sewage Disposal	Miles of Sewers Built			Water Consump'n per Capita, Gallons	Net Increase in No. of Water Meters	Water Mains Laid, Miles	Net Increase in No. of Fire Hydr'ts	Leaks in Water Mains Repair'd	Leaks in Service Pipes Repair'd	Street Openings, Number
		House	Storm	Combined							
Chicago, Ill.	Dilution			32.2	200	2,457	60.05	445	5,174	2,622	27,136
Baltimore, Md.											7,143
Cleveland, Ohio	Dilution				131	14,442	42.4	319	1,227	912	
Detroit, Mich.	Dilution				160	207	17.12		107	408	
New Orleans, La.	Dilution	¶					¶				
St. Paul, Minn.	Dilution			6.62							3,358
Cambridge, Mass.	Dilution	3.28	1.30	0.21	92.6	346	1.10	28	237	1,954	
Reading, Pa.	Filtration				125	220	1.88	20	70		
Nashville, Tenn.	Dilution			4.39		588	7.33	51			
Troy, N. Y.	Dilution			3.00	114		1.9	12			584
Somerville, Mass.	Metropolitan district	1.18		1.00	89	820	0.77	17		167	441
Springfield, Mass.		3.18									
Wilmington, Del.					100	488	1.88	17	12		
Pawtucket, R. I.	Septic tanks and filters	1.06			198	241	1.81	14	128		
Birmingham, Ala.	Septic tanks	0.85	18.2								
Altoona, Pa.	Intermittent filtration					27	0.76	14			
Augusta, Ga.		4.37				19	2.01	14			
Springfield, Ohio			0.16								
South Bend, Ind.				4.37		85	5.70	45			
Haverhill, Mass.		0.38	0.33		108	31	1.46	6			
Newton, Mass.		1.49	0.67		58	98	0.42	2	6		
Fitchburg, Mass.	Dilution			1.51	93	272	0.58	7			
Rockford, Ill.				3.44	108	296	3.69	11			
Atlantic City, N. J.					138	95	3.69	24			332
Woonsocket, R. I.	Filtration	0.80	0.38		76	118	1.62	16			537
Nashua, N. H.		0.15	0.38								
North Adams, Mass.		0.31	0.37			3	0.44	5			
Poughkeepsie, N. Y.				0.28		129	0.54	12	3		
Pittsfield, Mass.	Intermittent filtratio	1.18	0.42		80	26	0.15	5	28		
Marion, Ind.						44	0.14	2	4	4	
Concord, N. H.		0.27									
Medford, Mass.		0.33				117	0.45	10	72		
Gloversville, N. Y.		1.24	0.29				1.43	5			
Montclair, N. J.		2.14					3.10	18			
Carbondale, Pa.				2.5							
Melrose, Mass.		0.30	1.87				1.15	6	57	71	
Barre, Vt.		0.09					0.77	2			46
Greensboro, N. C.		1.33	0.50								
Mansfield, Ohio	Septic tank and contact filters			2.05		432	4.16	13			
Meadville, Pa.	Crematory		0.21				0.84	7			
Edwardsville, Ill.		5.0									

Name of City	Amount of New Street Paving, Square Yards							Sidewalks, Square Yards	Gutters	Street Dirt Removed, Cubic Yards	Method of Garbage Disposal
	Asphalt	Asphalt Block	Brick	Wood Block	Stone Block	Macadam	Other				
Chicago, Ill.										625,196	Private reduction.
Baltimore, Md.		5,747	1,132	5,542	272	3,990			*6,304 ft.	535,751	
Cleveland, Ohio										†45,566	Municipal reduction.
Detroit, Mich.											Private reduction.
New Orleans, La.	‡4.2										
St. Paul, Minn.	‡1.09		‡0.07		‡0.73			*47.8			
Cambridge, Mass.											
Reading, Pa.											
Nashville, Tenn.							**10,715		*35,000 ft.	†33,693	
Troy, N. Y.			20,880		560					§35,000	Cremation.
Somerville, Mass.					‡0.02			{ ‖5,149 *1,386 }			Sold for swine.
Springfield, Mass.					848	48,327	**18,371				
Wilmington, Del.											
Pawtucket, R. I.											
Birmingham, Ala.			36,974			70,000	**69,525	43,172	{ ††322 ‖1,490 *31,803 }		
Altoona, Pa.											
Augusta, Ga.			7,840		443	17,839	‡‡16,306		0,245 ft.		
Springfield, Ohio			4,704					*41,164	††25,409 ft.		
South Bend, Ind.			106,000			‡0.65		*14,855			Crematory.
Haverhill, Mass.						6,342		*1,700	§§5,101 ft		
Newton, Mass.											
Fitchburg, Mass.					1,884	2,465		*2,112			
Rockford, Ill.						45,856					
Atlantic City, N. J.											
Woonsocket, R. I.								5,930			
Nashua, N. H.											
North Adams, Mass.			760			‡1.00		***233	146 sq. yd.		
Poughkeepsie, N. Y.											
Pittsfield, Mass.									§§2246 s.yd		
Marion, Ind.											
Concord, N. H.											
Medford, Mass.							**3,455	{ ‖578 *390 }			
Gloversville, N. Y.		8,000									
Montclair, N. J.						‡1.75					
Carbondale, Pa.											
Melrose, Mass.						2,824		1,215	3,537 sq yd.		
Barre, Vt.					2,138			9,220 ft.			
Greensboro, N. C.			18,500					‡12.0			
Mansfield, Ohio	11,000		5,900					3,900			
Meadville, Pa.			3,745								
Edwardsville, Ill.			2.0					1.0	‡*2.0		

*Concrete. †Loads. ‡Miles. §Including garbage and ashes. ‖Brick. ††Combination curb and gutter. **Bitulithic. ‡‡Gravel §§Cobble. ***Tar. ¶New Orleans spent $3,000,000 on continuation of construction of new water and sewerage systems.

STREET LIGHTING DURING THE YEAR

Increase Shown in Various Municipalities—Conditions in Boston and Throughout Massachusetts—Forms and Rates for Electricity—Competition Between Gas and Electric Systems—Other Data

BY ALTON D. ADAMS
Gas and Electric Expert, Worcester, Mass.

STREET lighting is on the increase, both absolutely and in proportion to the population. Boston, Mass., furnishes a striking but hardly exceptional illustration of this fact, as may be noted from the following figures:

NUMBERS OF BOSTON STREET LAMPS

Year.	Electric Arc.	Gas.	Naphtha.
1900	3,024	8,320	2,551
1906	3,757	9,623	1,964

In 1900 the population of Boston was 560,892, and in 1905 the figures were 595,380, showing an increase of 6.1 per cent. during the five years. Between 1900 and 1906 the number of gas and naphtha lamps combined in Boston rose from 10,871 to 11,587, showing a percentage of increase nearly equal to that of the population. In this same period, however, the number of electric arc street lamps in Boston made a gain of 733, or 24 per cent., nearly four times the corresponding gain in population.

For the entire State of Massachusetts the increase of population from 1900 to 1905 was 7.06 per cent., while the number of electric arc street lamps in use there was 13,462 in the earlier and 1,740 in the later year, showing a gain of 26 per cent. In the five years just named the number of electric arc street lamps in Massachusetts rose from 4.79 to 5.67 per 1,000 of the population.

Gas consumed by street lamps in this same State amounted to 153,799,974 cubic feet in 1900, and to 172,471,115 feet in 1905, a rise of 12.13 per cent. In New York State electric arc street lamps rose from 32,324 to 35,337, or 9 per cent., between 1900 and 1906.

Chicago now has some 6,700 arc street lamps, and it is said that this number will be increased to 29,000 when power from the drainage canal is available.

FORMS OF ELECTRIC STREET LIGHTING

Open, enclosed and flaming arc lamps and incandescent lamps have continued their competition for public favor in street lighting.

While open arc lamps have continued to decline in numbers, and are often mentioned as an antiquated type, they still form no mean part of the total in electric street lighting. Both the fall in the numbers of open arc lamps and their present importance are illustrated by the figures for New York State, which show 19,888 such street lamps in use in 1900 and 9,298 such lamps in 1905. Meantime, in the same State, enclosed arc lamps on the streets have increased from 10,720 in the earlier to 24,189 in the later year.

This rise in the number of enclosed arc lamps has been due far more to the wishes of the electric companies than to any demand of the public. Enclosed arcs cost much less to trim than does the open type, and when operated with alternating current the open arc is unsatisfactory. It is somewhat cheaper to supply alternating than direct current to arc lamps, from many plants, and if statistics were available they would show that the great majority of enclosed arcs on the streets are operated with alternating current. On the other hand, for the same expenditure of energy, direct current gives much more light than alternating current in an enclosed arc lamp.

Flaming or luminous arc lamps, so called, have made some headway in their application to street lighting, but the relative value of such lamps for this work remains to be demonstrated. As a spectacular production the flaming arc lamp surpasses all other types, and it certainly shows larger mean spherical candlepower per unit of electric energy, but the strongest light rays leave the arc at angles that bring them to earth at short distances from the lamp. In street lighting the desideratum is a sufficient amount of illumination at points midway between lamps rather than a blinding glare of light at the lamps themselves. Small arc lamps operating with 30 to 50 per cent. of the power usually consumed at each arc, in the United States, are largely used in Europe and contribute materially to a better distribution of light. Flaming arc lamps make no advance over the earlier types in the division of electric light, and their use will hardly reduce the cost of a minimum degree of illumination between lamps on the street.

In spite of the great advances that have been made in the efficiencies of metallic filament incandescent lamps during the year, such lamps have not been adopted for street lighting, but their use would effect a large saving of energy and consequent reduction in costs.

RATES FOR ELECTRIC STREET LIGHTING

The lamp-year instead of the kilowatt-hour continues to be the unit of service named in most street lighting contracts, and the result is usually much uncertainty as to the service to be rendered, and great differences between the rates paid for equal amounts of energy and illumination in various cities. Beyond doubt, the fairest basis of rates in street as in private lighting is the kilowatt-hour, and, more than this, the contract should state whether the energy is to be delivered in the form of direct or of alternating current. This last point is important, because direct-current are much more efficient than alternating-current arcs. With either type of lamp

the total hours of yearly operation and the number of watts consumed must be known before there can be any intelligent comparison of rates.

As a rule, the tendency of rates for electric street lighting has been downward during the year. This downward tendency has been partly due to the increasing competition of long transmission systems, partly to the desire to prevent the erection of municipal plants and partly to the fear of legislative reductions of rates. In some cases unusually low rates for street lighting appear to have been made by private corporations, for the purpose of inducing cities or towns to discontinue the operation of their municipal electric plants. A few illustrations are sufficient to show the extent of the reductions that the forces named have made in rates.

Toledo, Ohio, has been paying $83 per year each for enclosed arc lamps of nominal 2,000 candlepower, but the contract for street lighting ends with the present year, and the company that now operates the lamps has reduced its rate to $47 per year for the same lamps, on a ten-year contract, under the stress of competition. For luminous arc lamps in place of the enclosed arcs the bid of the same company is down to $45 per lamp per year.

At Lockport, N. Y., where energy from Niagara Falls is distributed, the electric company recently reduced the rate per arc street lamp from $75 to $50 per year and got an extension of its contract for about three years.

Peabody, Massachusetts, which operates a municipal electric plant, recently employed an engineering concern to report on necessary changes in its generating equipment, and in the report of this concern it was suggested that the town had better discontinue the operation of its generating plant, because private plants in nearby cities would be glad to furnish all the energy desired at two cents per kilowatt-hour.

A few months back the small town of Templeton, Mass., had the matter of a municipal electric plant under consideration, but finally decided not to build a generating station, because a private system in an adjoining municipality offered to supply all of the desired energy for four cents per kilowatt-hour at the town line.

Utica, N. Y., has been paying $109.50 per lamp per year for about 870 enclosed arcs of 2,000 nominal candlepower each, but the bids of two competing transmission systems, one of which has been doing the street lighting, have cut the rates for these lamps to $56 and $45, respectively, per year. The lower of these rates will save the city nearly $50,000 yearly.

Gas and Electric Competition

Competition between gas plants on the one hand and electric plants on the other is highly desirable, because it tends toward the most efficient development of each system and to reasonable rates for the two kinds of service. The serious objections urged against the competition of electric plant with electric plant, and gas plant with gas plant, because of the unnecessary duplication of apparatus and the ruinous reduction of rates, have no weight against the competition of gas with electrical supply, for each service is wanted at its best in any event. For this reason the laws of England and of other parts of Europe have made the combination of gas with electric systems generally impracticable.

Unfortunately, the same cannot be said of the United States, and combination of gas with electric plants is going on here at a rapid rate. Even in Massachusetts, where the law lays some impediments in the way of combinations of gas with electric systems, a number of such combinations have been effected. These combinations have usually operated to retard the development and keep up the rates of either the gas or the electric system, or of both, as might be expected.

In open competition the rates for incandescent gas lamps on the streets are usually lower than the rates for electric arcs, if the same degree of illumination is required of each. This lower cost of incandescent gas lighting is leading to its rapid extension on many of the streets of Europe, to the exclusion of electric lamps. A notable example of incandescent gas lighting exists at Edinburgh, Scotland, where the streets are supplied with 1,052 electric arc lamps and 10,118 gas lamps, besides the 11,802 gas jets on the common stairs. The interesting feature of this street lighting is that 5,085 of the gas lamps have inverted burners that were adopted after a long series of tests had shown their superiority over upright mantle burners. Most of the light from these inverted burners is radiated at and below the horizontal plain, so that they compare favorably with incandescent electric lamps in this respect. These inverted burners at Edinburgh are regulated at two cubic feet to four cubic feet per hour, and the gas is supplied to them at the regular street pressures. A larger type of gas lamp that is finding its way onto many English streets is illustrated by the recent installation at the new Victoria Station, London, where a space about 320 by 1,600 feet is lighted by some 140,000 candlepower from nearly 400 high-pressure gas lamps. These lamps range from 175 to 1,000 nominal candlepower each and are supplied with gas that has passed through compressors on the station grounds. Gas was selected for lighting this station, in spite of the offer of electric energy at about two cents per kilowatt hour for the purpose. Another notable London installation of high-pressure and power gas lamps is that on the new Vauxhall Bridge, which has recently been completed over the Thames, at a cost of nearly two million dollars. In this instance the lamps are rated at 600 candlepower each, and they are supplied with gas direct from the city mains. More than 200 of this same type of gas lamp are used at the Mersey Docks, Liverpool.

The 9,623 gas and 1,964 naphtha lamps on Boston streets are all provided with incandescent mantles, and this is true of the great majority of the nearly 1,600 gas street lamps in Massachusetts. Probably all of the incandescent gas lamps on Massachusetts streets are fitted with upright mantles, and most of them are rated to consume about three cubic feet of gas per hour, at the pressures supposed to exist in the mains of the companies.

CHERT ROADS IN ALABAMA

Abstract of a Paper Presented Before the American Society of Municipal Improvements by Prof. Edgar B. Kay

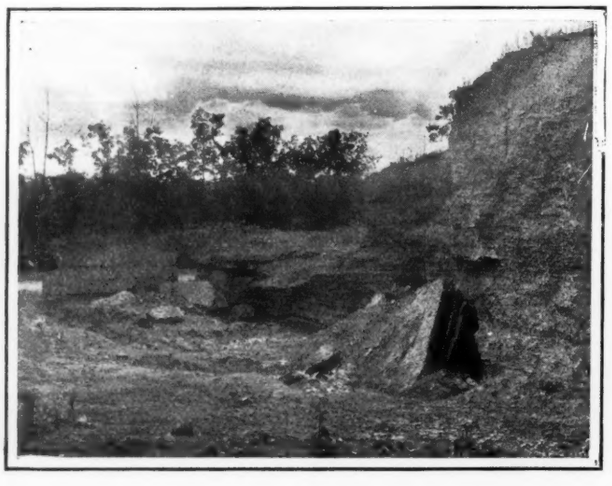
ALABAMA cherts bind together readily and make cheap macadam roads that wear well and are smoother than roads built entirely of limestone. These cherts contain clay and iron oxide between the cleavage joints and are easily and cheaply quarried and do not require crushing. The total cost on board cars at the pits, in the Birmingham District, does not exceed 25 cents per cubic yard. The breaking is usually done by rolling or by napping hammers. This material produces a road surface which is very smooth but not slippery, of considerable elasticity but hard enough to have a low tractive resistance. These roads do not rut under any condition of traffic, even after twenty years' service with practically no repair. They are comparatively noiseless and yield neither dust nor mud; drain off rapidly and are practically impervious.

Chert, or flint, is in itself one of the hardest of rocks, but is everywhere found mixed with more or less limestone or sandstone. Government tests have resulted as follows: French coefficient of wear, 1.4 to 14.6; hardness, 19.1 to 19.6; toughness, 7.0 to 21.0; cementing value, dry, 1.0 to 36.0, wet, 5.0 to 106.0. The cementing value is low, but the accessory minerals, pyrite, magnetite, limonite, calcite and chlorite have high cementing value. Chert is found in the sub-carboniferous and silurian outcrops in Alabama, which extend through the northeastern part of Mississippi, and thence through Tennessee, western Kentucky, southern Illinois and Missouri, and thence Arkansas and Oklahoma. In the Birmingham district it is found in inexhaustible supply overlying the red sandstone.

METHODS OF CONSTRUCTION

Mr. M. O. Eldridge, Chief of Records U. S. Office of Public Roads, in June number, 1906, of *Good Roads Magazine*, says: "The roadbed should be shaped with a road machine before the material is placed and given a slight crown of from three-eighths to one-half of an inch to the foot from the center to the sides. The foundation should then be rolled, the material for the first course spread in two layers and rolled and sprinkled in the usual manner. The spreading of the material can be accomplished by the use of a road machine, provided the gravel is not too large. The total depth may vary from four to nine inches at the center, as soil and traffic may require, and gradually diminish in thickness to what is commonly called a 'feather edge' at the sides. If the most approved method is followed, shoulders should be provided to hold the material in place. The material should then be spread to a uniform depth from the center to sides."

In Jefferson County and Birmingham, Ala., the early chert roads were built without any attempt to consolidate the foundations or to compact the chert. There are probably over 200 miles of chert roads in Jefferson County with widths varying from 16 to 24 feet. In 1887 the Cato City Land Company cherted about a mile of street, which is a part of the county road system, and the road was extended in both directions, using the same material. Although there is as heavy traffic over this road as any in the county, and it has been in constant use for nineteen years, with little or no repairs, the road is still in good condition. The county roads were originally built by placing upon the sub-grade limestone crushed to pass through a 2-inch ring and spread 9 inches thick in center and 6 inches in thickness at the edges. Over this was spread a layer of chert from 3 to 4 inches in thickness, which under traffic soon formed a smooth cemented roadway. The county has never owned a roller and none has been employed on any of the roads. The present practice is to place furnace slag upon the sub-grade which is crowned 6 inches at center and from 12 to 18 feet in width, the slag being put on 6 inches in thickness at center and about 4 1-2 inches at sides. Chert is then placed 4 inches in thickness at center and about 2 inches on sides. The city of Birmingham has about forty miles of chert streets or roads. Some of these streets were built by simply forming the natural material of the street and compacting it with a steam roller. The roller used by the city weighs fifteen tons, weight on each 20-inch wheel 6 feet in diameter being five tons. On all cherted streets a foundation course of slag is



CHERT BANK, FLORENCE, ALA.

CHERT PAVING ON SIXTH AVENUE, BIRMINGHAM, ALA. AFTER 19 YEARS' USE

placed on the well-compacted sub-grade. The slag delivered and rolled costs 80 cents per cubic yard, put on 4 inches in thickness or 9 cents per square yard. The chert costs from seventy-five cents to one dollar and twenty-five cents per cubic yard on street in place and rolled. It is spread on an average to a thickness of 5 inches in center and decreased to 3 inches at sides and rolled until smooth and compact. The center rise or crown, where chert is used at Birmingham, is about one-thirtieth of the width of street measured from outside of gutters. Gutters are 3 feet wide, measured from outside edge of curb. On grades, a little in excess of one-thirtieth of street is used to determine center rise. There are streets in Birmingham with grades as high as 15 per cent., on which this material has been placed.

The chert now being used at Birmingham comes from banks near Bessemer. It costs about sixty cents per ton f. o. b. cars Birmingham, including freight charge of twenty-five cents per ton, and weighs about twenty-eight hundred pounds per cubic yard on cars.

In Jefferson County, where slag is not available, the foundation course is made of the harder and coarser portions of the chert used and placed from 4 to 5 inches thick, the top course being the same as where slag is employed for a foundation.

At Cairo, Illinois, the Elco chert was used on Commercial avenue, the chief business street, on a sand foundation; thickness of chert compacted about 8 inches. It has been placed for a number of years and the street is still in excellent condition. Eighth street, in the same city, was improved by placing a 6-inch course of uncrushed chert on the sand foundation and a 2-inch top course of chert crushed to pass a three-quarter-inch mesh. This street, after four years' use, is smooth and in excellent condition.

THE YEAR'S CONSTRUCTION WORK

Amount of Paving, Sewerage, and Waterworks Construction Let by Contract During the Year 1906

It is, on the face of it, practically impossible to obtain information of all municipal work done throughout the country, but a review of that obtainable will be of great interest as indicative of what has probably been done by other municipalities and companies which have not given prominence to the same. The figures are all for the year 1906.

Paving

The National Paving Brick Manufacturers' Association informs us that approximately the following amounts of brick paving have been laid in the States listed: Ohio, 1,500,000 square yards; Indiana, 750,000 square yards; Illinois, 1,500,000 square yards; Michigan, 700,000 square yards; Wisconsin, 500,000 square yards; Minnesota, 175,000 square yards; Kentucky, 400,000 square yards; a total of 5,525,000 square yards for these States. In addition we find that contracts were let for the following: 4,500 square yards in New England; 120,000 square yards in New York State; 24,000 square yards in New Jersey; 54,000 square yards in Pennsylvania; 200,000 square yards in other Eastern and Central States, and 2,500 square yards in the State of Washington.

Of asphalt, we note contracts having been let for 230,000 square yards in the Eastern States and 149,000 square yards in the rest of the country.

Of asphalt block, 155,000 square yards in the entire country.

Of bitulithic, 2,881,715 square yards in the entire country.

Of wood block, 209,213 square yards in the Eastern States, Ohio and Illinois (by the U. S. Wood Preserving Company).

For rendering macadam roads dustless both oil and tar have been used to a considerable extent this year. Practically no figures can be given for the amount of road oiled. The manufacturers of Tarvia inform us that enough of that article was sold to cover 800,000 square yards.

Sewers

In the Eastern States 197 miles of sanitary sewers were contracted for; also one complete system. In New Orleans 80 miles were contracted for; and 130 miles in the Mississippi Valley and Great Lake region, together with three systems, whose lengths are not stated. In the Western States, 23 1-2 miles, and one additional system. Of storm sewers 41 miles were contracted for. Six municipalities contracted for disposal plants, of which at least three were septic tanks.

Waterworks

New York is constructing 55 miles of high-pressure fire service mains, with 1,272 hydrants, for which the contract price is $2,824,282. (Toronto, Canada, is also constructing a high-pressure system.) In addition to this there has been laid in the Eastern States 75 miles of mains, 353 tons, and six small plants. In the Central States 35 miles of mains, 2,600 tons, and 14 small plants, besides 100 miles of mains at New Orleans, now under construction. In the Western States 68 miles of mains were contracted for and two small systems. Also contracts were let for fourteen standpipes and tanks (two of reinforced concrete), seven reservoirs, four sedimentation basins, seven filtration plants, nineteen pumping plants (of which six were gasoline and two electric); 560 fire hydrants, which we find reference to, probably forms but a small percentage of those sold; and the same is true of the 736 meters reported, one manufacturer alone reporting the sale in this country of 25,000 (others did not wish to give the figures of their sales). Of those 736 it may be interesting to know that 580 were ⅝-inch, 75 were ¾-inch, 50 were 1-inch, 5 were 1½-inch, 20 were 2-inch, 5 were 3-inch and 1 was 4-inch.

In addition, municipalities constructed, among other things, thirteen electric-light plants and one gas plant, while there were any number of undertakings upon which a number of cities ventured.

VALUATION OF FRANCHISES

Rights and Privileges and How Granted for Public Utilities—City in Reality a Partner—The Struggle for Wealth—Corporations and Government—Taxes

By WILLIAM D. MARKS

A FRANCHISE is usually the right to occupy the streets and public lands of a municipality or of some civil division (granted to an individual or to a number of associated individuals) with the apparatus required to meet public necessities. A telegraph or telephone company, or an electric-light and power company, may wish to erect poles or to stretch wires along the streets and roadways. A railway company may also wish to do this, and, in addition, to lay rails and operate cars upon the surface of the street. A water or gas or electric company may wish to dig up the streets and lay pipes and conduits in trenches underneath them.

When a franchise is granted for any of these various purposes, the municipality does not make over the ownership of the real estate in its public highways to these public service corporations or individuals, but it does grant the right to them to occupy the land in the streets with their apparatus, and to use this apparatus when placed in position, and to repair and extend it without accounting for trespasses.

Sometimes a franchise is granted in perpetuity, without any specified date for termination, and again, the duration of the franchise granted is fixed at twenty-five years or some other period, and an annual rental or tax or royalty is demanded for the use of the public streets.

Thus it will be seen that a party obtaining a franchise does not own the real estate belonging to the public transferred to it, but merely becomes a tenant of public property, unless the franchise is perpetual, in which case it is equivalent to giving the party obtaining a franchise the ownership of the real estate occupied, limiting its use to the purpose specified in the franchise.

Municipality a Partner

Whenever an individual or a corporation receives a franchise from a municipality, this municipality becomes a partner, furnishing the real estate required by its distributing apparatus or plant, but requiring the individual or corporation to install this apparatus or plant at its own expense. Thus a water company will dig trenches and lay water mains and services through the streets of a municipality and will be obliged to pay the first cost of this apparatus and of placing it in position to do business.

The municipality has contributed the use of its real estate for the purpose of this business, and therefore may be regarded as having entered into a partnership with the water company, or at least as contributing the use of real estate of value to its capitalization. If capitalization of this franchise exists, it is obvious that this capital belongs to the city and should be issued to it. It might appear as if upon the value of this real estate contributed for the purpose of the company principally depended the valuation of its franchise, but many and confusing factors have been found to enter into this valuation.

The resources of the United States, the boundless opportunities for the acquisition of sudden wealth, and our ever-increasing flood of agricultural products have contributed to dazzle and make our business men money mad. Forgetting everything else, they change from business to business and grasp at opportunity after opportunity, regardless of all other considerations than immediate profit.

The Struggle for Wealth

In this riotous struggle for wealth it is being for the first time clearly comprehended that dishonorable men, using illegitimate and thievish methods, are grasping great fortunes, while honorable men, doing legitimate business, carry the heavy handicap of earning their money slowly and honestly.

While our business men are thus forgetting their duties to their Government, the matter of governing has been taken up by a class of quick-witted, plausible and sometimes thievish citizens, who seek public office as their business in life and have been classed as politicians.

In order to hold themselves in office, these politicians take advantage of the gregariousness of humanity and create parties who have inculcated partisanship until it can literally be defined as gregariousness gone mad.

In these political parties the extreme partisans are rewarded by public offices, regardless of their honesty, their education or their ability, and as a consequence we permit the grotesquely solemn farces of officials placed at the head of departments of whose business they have not a scintilla of practical knowledge, of commissions on railways, on gas works, on electric-light works, on rivers and navigation, composed of lawyers, of dry goods merchants and book agents, who have never heard and who can never learn anything of such business, the only factor considered in their appointment being their blind partisanship and their ability to command votes for their party. We frequently find these office-holders granting valuable franchises for wholly mercenary reasons.

These elements in the business and in the political world are, however, only temporary symptoms on the surface of the confusion resulting from the too rapid growth of a great nation. Underneath, the great mass of American citizens are honest and able, but they are preoccupied with the immediate concerns of a new country and they lack the thoughtful leisure necessary to their education in the affairs of government.

Were not the majority of American citizens of a high grade of honesty and of ability, our republican form of government would prove an immediate failure, and its

theory of universal suffrage an illusion. The symptoms which I have just mentioned are but temporary puerilities, due only to the youth and the rapid overgrowth of our country.

We are growing into manhood, and with our manhood is coming a realizing sense that political partisanship and illegitimate schemes for legalized thievery are not business and must not be tolerated. In every State and every city we are proving to-day that these forms of rascality are understood, and are driving this scum of rascality off the surface of our civilization by our votes in public elections, and by our laws enacted under the determined, yet self-restrained, demand of public opinion.

Corporations and Corruption

There is no more facile instrument of corruption in the hands of cunning men than a corporation allowed to work in secret. A corporation is chartered by the State for the purpose of enabling a large number of individuals, each contributing a small amount, to join together in the prosecution of some business requiring a capital much larger than any individual or small number of individuals could furnish, and these corporations have proved a mighty instrument for good in the vast enterprises required in developing this United States: but cunning men have found out how to use them for the purpose of pilfering large fortunes from the honest and industrious toiling masses of this country.

They obtain a charter, preferably under the obligingly tricky laws of New Jersey, and issue as much stock and as many bonds in excess of the real investment required as the public can be persuaded to buy; they hire honest and skilled men to take charge of the legitimate business and the productive labor required for the corporation's development; they place in charge of its finances a board of directors composed of men skilled in all the illegitimate methods for taking advantage of the weakness, the ignorance, the vices and misfortunes of their fellow men, and, if possible, they create a monopoly for the products of the corporation, and, by myriads of small overcharges, of unjust profits, render stock and bonds in these corporations (which no more represent real labor or real property than does a counterfeit bank note) salable because they can pay interest and dividends on them out of their stolen profits. The United States Steel Corporation is an excellent example of a monopolistic corporation.

The cunning promoters of this form of secret corporation usually manage to sell enough bonds to obtain all or more than the actual cash capital required, and divide amongst themselves the stock, which, being dividend paying, has a market value, and in a more or less brief period they become that form of parasitic millionaires which seems to so much interest writers for our daily newspapers.

Fortunately, the honest toilers of this country are being informed and to-day have grown to heartily despise men who have thus not earned, but pilfered, money from creators.

In the United States the growth of a village into a city and then into a metropolis frequently occurs within one generation. When a city reaches a population of about 75,000 it changes its characteristics and its mode of life. It becomes a true mother city to all the surrounding towns and villages.

Great factories and great office buildings are erected in it, the stores grow into vast magazines containing everything required for the feeding or the clothing of man, life becomes more strenuous, the theaters increase in number, the street cars are more largely patronized, the wealthy people live in suburban residences, the laboring people find their recreation in summer parks and theaters, and the demand for water, gas, electric light, for car service, and for all the luxuries of life is greatly increased. Not only does this demand increase with the constantly increasing population in a metropolis, but it is also found by statistical research that the demand of each individual in a metropolis is greater than it is in the smaller cities and villages, and so corporations supplying water, gas, electricity and transportation have found a metropolis the most lucrative of fields, and because of the natural conditions existing they have also found lighting, transportation, water and telephones and telegraphs to be natural monopolies, because it would prove very inconvenient, as well as costly, to duplicate, in the paved and busy streets of a metropolis, the various services enumerated.

Franchise Valuations

It is in the metropolis that the question of the value of a franchise has become one of very grave concern. These franchises are of enormous value. For instance, in the city of Philadelphia, the Philadelphia Rapid Transit Co. is paying to certain dead companies, in the form of rental of their franchises in perpetuity, something over $6,000,000 a year, and, as these companies have vanished, except as to their franchises, they appear to be paying into dead hands, at the mouth of a bottomless pit, something like $12,000 per mile annually for the use of the tracks in the streets of Philadelphia.

In New York City, the Consolidated Gas Company paid to the New York Power Company $36,000,000 for stock in the Power Company, which was wholly water, merely for the purpose of gaining control of the electric-light franchises of New York City. These are two instances quoted as the most prominent of hundreds of similar cases of the valuation placed on franchises, which are practical monopolies, and therefore enable these monopolies to wring extortionate profits from the citizens of these cities for the services which they offer.

If we go to the other extreme of the small villages and towns, it is a well-known fact that a local street railway or gas works or electric-light works or telephone company can only obtain a small profit, if any at all, in towns of less than 50,000 inhabitants, and so it is possible that these small public service corporations might justly claim subsidies from these small towns, for it is only by the closest economy and the most careful management that they are able to make any money at all.

Of course, every case must be considered and decided by itself, and I have spoken in averages, to which there are always exceptions.

It is a thesis which is not denied by any thoughtful man, that a concern which does not earn a profit is of no ultimate value to the community in which it exists, and therefore the judicially fair citizen will agree with me that, while it is necessary to guard the community against robbery by a corporation, it is equally necessary to permit that corporation to make a fair profit on its actual investment.

If no payment is demanded for a franchise granted to a public service corporation, then that company should be forced by government to make public all of its costs, its gross earnings, its operating expenses, and its prices should be from time to time so adjusted as to return a fair profit on the actual cash investment made. If, on the other hand, the community decides to place a value upon a franchise granted, endless discussion and confusion will result as to the value of this franchise, because it depends upon the characteristics and density of the population, upon the management of the company, and upon the daily progress and changing inventions of scientific workers.

However valuable the real estate in the street in which a pipe is buried may be, the value of that pipe to a gas or waterworks depends wholly upon the demand for gas or water, and, while the real estate may continually increase in value, the pipe itself is depreciating, and it may possibly be that the demand for water or gas will diminish or cease altogether.

If a tax or royalty is insisted upon, it takes its clearest and best form in the present arrangement in the city of Philadelphia, where the city obtains a royalty of ten cents on every thousand cubic feet of gas. In other words, if it is necessary to tax public service corporations, they should be taxed upon the gross earnings of their business, and not upon the real estate valuation of the streets in which they may have their pipes, conduits, rails, poles or wires. In the writer's opinion, it is far better not to have any franchise tax at all, but rather to demand of each corporation an exact appraisement of the cash value of its property, entire publicity as to its earnings and operating expenses, and the annual fixation of a price which shall yield a predetermined fair profit on the actual investment.

The dawn of a better, happier day is upon us. American citizens are honest and able, and they are insisting that these corporations shall conduct their business honestly and are driving the criminals of finance from power; they are regulating our corporations and demanding real publicity of their affairs.

Our municipalities are regaining franchises unwisely granted for the use of their streets, and our States and National Government are forcing our dishonest railway officials to give to every man an equal opportunity.

The Quaker doctrine of content with one's own rectitude, and ignoble silence and submission as to the dishonesty of others with whom we deal, is no longer accepted.

American citizens intend to be honest themselves, and to force those who deal with them to deal honestly. The past night of thievery is dispelled, and the broad daylight of honesty enforced by publicity has dawned upon us.

REINFORCED CONCRETE STANDPIPE

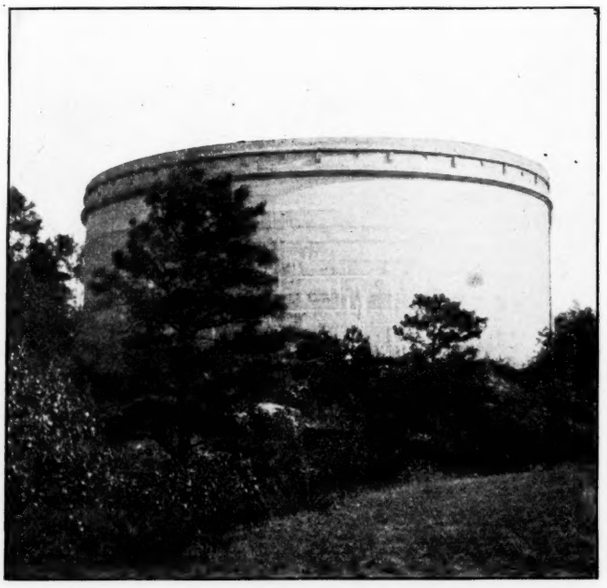
A Description of One Built at Waltham, Mass., in 1906—Points of Difference from Those in the December 4th Issue

At Waltham, Mass., there was built, in 1906, a reinforced concrete standpipe or reservoir, 100 feet in diameter and 37 feet high from the floor to the steel trusses of the concrete roof, the apex of which is 13 feet higher. The shell is 18 inches thick at the bottom and 12 inches at the top, there being a continuous batter on the outside from top to bottom. The floor is 12 inches thick, and rods embedded in this were bent at right angles and stood upright about two inches from the outside face of the shell for a height of about 3 feet from the base. The reinforcement consists of round steel rods, lapping 40 diameters at the joints, supported by lattice work, as shown in the illustration; this lattice work being a feature which is, we believe, peculiar to this tank. The rods are in two ties, each about one-third the thickness in from each face.

The concrete was deposited between movable forms about 3½ feet high. These were constructed of boards nailed to top and bottom curved templates, making sections about 3½ feet high and 5 long. These were coupled together in pairs, four bolts passing through each pair, and the sides being held apart temporarily by strips of wood of proper length placed just above each bolt. Surrounding the tank was set a well-braced, stiff scaffold, and the forms were tied to this.

In the center of the tank an overflow pipe was placed vertical and surrounded with concrete, the whole forming a central support for the roof.

On filling the tank there was seepage at a considerable number of points, which shows in the illustration, but which has now practically stopped.



REINFORCED CONCRETE STANDPIPE AT WALTHAM, MASS.

This tank was built by the Simpson Brothers Corporation; Mr. Laroy Brown was the superintendent of the water department, and the engineering work was performed by Mr. Bertram Brewer, City Engineer. The work was carefully inspected during construction.

Prices of Materials in 1906

AMERICAN Portland cement sold at $1.15 to $1.20 through January, February and March, and $1.20 to $1.30 for the balance of the year. The German cement sold at $1.90 to $2.10.

Asphaltum prices at New York were as follows: California, $19 to $21 per ton up to November, when the price advanced to $20 to $23. Trinidad, $20 to $25 until November, when it advanced to $22 to $25. Venezuela, $25 to $30 until November, when as high as $60 was charged. Bermudez, $25 to $30 until November, when some lots brought $35.

Tar pines in New York: $5 to $5.50 per barrel until October, when they advanced to $5.85, $6, and above.

Sewer pipe sold at a discount of about 70 per cent. in carload lots.

Steel plates sold as follows: In New York, tank, 1.745 cts. per pound until March; 1.745 to 1.845 until June; 1.765 to 1.865 until November, when they advanced to 1.945 to 2.045. Tank steel sold in Pittsburg at 1.60 until November, when it advanced to 1.70.

Pig lead sold in New York as follows: January, 5.600 cts. per pound; February, 5.464; March, 5.350; April, 5.404; May, 5.685; June to October, 5.750; December, 6.05 cts.

Water pipe averaged about as follows in large contracts: New York, 6-inch and up, $29.75 until April; $30.50 until June; $32 until October; $34.50 to $36 in December. In Chicago, 6-inch and up, $30 until June; $31.50 until November; $34.50 in December.

Relative Costs of Cleaning Various Pavements

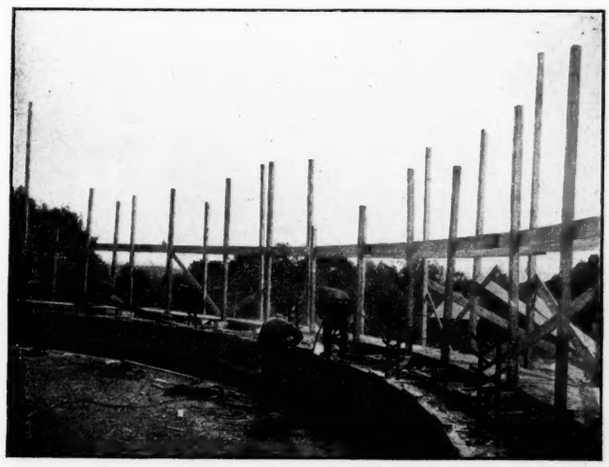
ONE of the important items in comparing the relative cost of different kinds of paving is the maintenance, in which the cleaning should be included. Colonel Waring once stated that the saving in cleaning New York's streets, if all cobble and stone block paving were changed to asphalt, would be sufficient to pay for the change. The relative costs as estimated by contractors were illustrated in a letting for street cleaning in Philadelphia, December 17. The lowest bids per great square were 34 cents for asphalt and brick, 37 cents for granite block, and 38 cents for cobble and rubble. The averages of four bids were 36½ cents for asphalt, 38 cents for granite block, and 38¾ cents for cobble and rubble; the average bid for granite being 4.1 per cent. higher than for brick and asphalt, and for cobble being 6.2 per cent. higher.

Refuse Destructor

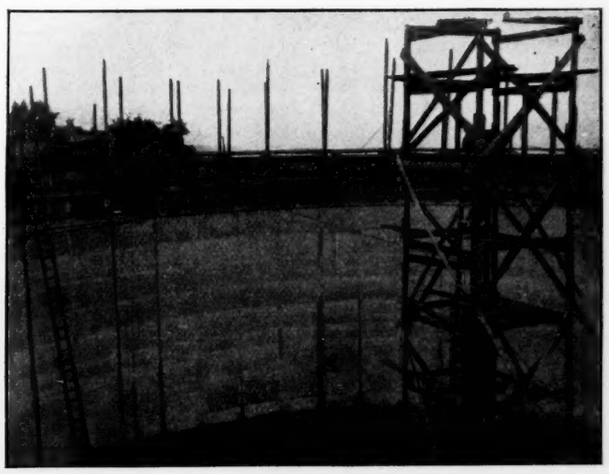
IN ACCORDANCE with requirements described in our issue of December 5, pages 558-561, and referred to in editorial, December 12, page 587, bids were received for a Refuse Destructor at Port Richmond Staten Island, December 27. The Decarie Company, Minneapolis, submitted three bids, with an additional price for a gas furnace, varying from $18,600 to $32,600. Kienan and Froude Company, Manchester, England, bid $23,995. The Universal Destructor Company, New York City, tendered, for a Meldrum Destructor, $22,535.

In Favor of Tar Sidewalks

A CORRESPONDENT, referring to the quotation in our December 5th number of a portion of the annual report of the City Engineer of North Adams, Mass., has called attention to several points connected with tar sidewalks in general, and these in particular, which we are glad to present to our readers as additional information concerning "a walk that has given such general satisfaction as tar walks have given in New England, where they are best known." He states that, while the City Engineer "has undoubtedly stated the facts as he finds them, the walks which he is having to repair at the rate of some 5,000 yards a year were laid from nine to thirteen years ago, at the rate of 10,000 to 20,000 yards per year, at a cost of 45 cents per square yard, a price which every contractor knows will not pay for the material and labor necessary to do first-class work. The walks were laid without specification except as to thickness, and without



REINFORCED CONCRETE STANDPIPE, SHOWING LATTICES AND REINFORCING RODS.



SHELL OF STANDPIPE NEARLY COMPLETED. OVERFLOW PIPE IN PLACE.

inspection; and the wonder is that any walk laid at such a price is, after ten or twelve years, in condition even to be repaired, and not that a third of them are in need of repairs.

"Pittsfield is a good comparison to North Adams; only twenty miles distant, and with conditions of soil and cost of gravel and sand practically the same as in North Adams, the city has laid its own tar walks for some fifteen years, at a cost that has not exceeded 65 cents per square yard. There is hardly a crack in all that have been laid, and the only repairs from year to year are those where the walks have been injured by other than ordinary wear and tear.

"The results in the two cities are the natural ones. In Pittsfield there are only four business blocks that have any other material for walks than tar concrete, and nothing else is considered; while in North Adams the cry is, 'Tar walks are no good. Give us cement.' It is the old story of getting only what is paid for; and if the same comparatively low price is paid for cement walks in North Adams as was paid for tar walks, it is a safe prophecy that the results will be even worse.

"The conditions in the two cities named are characteristic of those found throughout New England. Where tar walks have been laid with intelligence and honesty, they have given such satisfaction that no other walk is considered, even in this day of cement; while in other places, where the work has been done at very low prices, and often by unscrupulous contractors, the result has been far from satisfactory. The work in Pittsfield, however, and in many other New England cities is conclusive proof that with specifications carefully drawn to correspond with local conditions and to cover the use of the best materials, and with the work done by reputable contractors under intelligent inspection, any city or town can have coal tar walks that are not only economical, but satisfactory."

CORRESPONDENCE

Municipal Journal and Engineer,
Flatiron Building, New York.

Gentlemen:—I would be very grateful to you for any information you may give on the method of calculating the size of siphons. I wish to take care of an 18-inch sanitary sewer line crossing a river about 135 feet span. It is about 18 feet from grade line of sewer to rock in the river. If you do not have this information at hand I would be thankful for a suggestion as to where I may be able to obtain it. Yours truly,

C. M. T.

Folwell's Sewerage, pages 138 and 185, gives the principles of design of inverted siphons; and they are further treated of on pages 81, 132, 251 and 329. Special pains should be taken to insure sufficient velocity in a siphon to render it self-cleansing—three or four feet per second, if possible; and this during the minimum daily flow. To find the size of sewer required, determine the minimum flow in cubic feet per second (if this cannot be determined it may be assumed at half the average rate of flow), divide this by the velocity desired, either three or four, and the quotient will be the area of siphon necessary. It is important to obtain, in the designing, a sufficient fall in the width of the river to produce this velocity. If the 18-inch sewer now runs half-full on an average, with a velocity of 2½ feet per second, the above would call for an 8-inch siphon pipe, with a fall of 2.6 feet between the ends of the siphon. If it will not be permissible to discharge sewage into the river temporarily in case of a stoppage of the siphon, a duplicate siphon pipe should be provided. Editor.

Editor Municipal Journal and Engineer,
Flatiron Building, New York City.

Dear Sir:—The population of our city is about 7,000; the lighting system is an alternating current; and we wish to know what would be the proper voltage for 16-candlepower lamps to be maintained at, and what should be the average consumption of Watts by such lamp when the plant is run at the proper standard. The 16-candlepower lamps now in use are 104 volts. The street lamps 1,200 candlepower. The general impression of the patrons is that the lights now furnished are not up to the proper standard; that is, the belief is that the 16-candlepower lamps only furnish about 10 candlepower; and as I understand it a 16-candlepower lamp that would only have voltage sufficient to furnish 10 candlepower would consume as much current as though it was furnishing 16 candlepower. In other words, we are paying for a 16-candlepower light and getting about a 10-candlepower light. What we want is to insert a clause in our new ordinance that would specify a standard that would insure to the patrons an up-to-date service. And if you could inform us what terms would describe such standard, you would confer a great favor on Yours truly, J. E. W.

We would suggest that a new contract with the company should contain a clause somewhat similar to the following: The voltage at the terminals of any incandescent lamp shall not vary by more than 2 per cent. from that voltage at which it delivers its rated candlepower; and at no time during the life of the lamp shall the consumption of electric power, measured at the lamp terminals, exceed 4½ watts, but mean spubrical candlepower; nor shall that of new lamps exceed 3½ watts. Each lamp to show 16 actual candlepower as tested by the regulation sperm candle. The common voltage for incandescent lighting is 110, but the 104-volt system should give satisfactory service. The important part is that the voltage at the lamp terminals shall be that for which he lamps are rated. Since also the efficiency of an incandescent lamp decreases steadily throughout the life of the lamp, provision should be made for its renewal when the efficiency has reached a predetermined figure. You are correct in your belief that a 16-candlepower lamp when furnishing only 10 candlepower would consume almost as much current as that acting with full efficiency. In this connection I would beg to refer you to pages 452 and 446 of the present volume of the Municipal Journal and Engineer.—Editor.

Editor Municipal Journal and Engineer,
Flatiron Building, New York City.

Gentlemen:—Our City Council has recently been petitioned for legislation to provide for the macadamizing of several miles of streets in the city. We have easy access to a large output of slag at not excessive cost, and the petitioners wish to use this material in the improvements. We already have a number of blocks of slag macadam streets, and our experience is that this material picks up on muddy wheels and carries off and that the mud and slag together drop in lumps, causing holes and humps which resemble the waves of the lake in looking along the length of the street. The fine slag used for the top coating is also affected more or less by heavy, dashing rains. The committee of the Council to whom these petitions were referred are anxious to learn if there is not some way of constructing a good roadway by the use of this slag. They wish, however, to use it in such a manner as to prevent its being picked up or washed out by the heavy rains, and at the same time to be more easily cleaned than the common rolled slag macadam. One member suggested using a coating of about three inches of slag concrete to cover the macadam or mixing the last inch of fine slag with tar or something which would hold it in place.

The points upon which I wish your opinion are: How thin a coating of Portland cement concrete would stand traffic as a wearing surface if placed upon a bed of eight inches of thoroughly rolled slag? Should this concrete be put on in one layer or more? What other mixture than concrete would answer our purpose and still make a road which would be inexpensive and at the same time durable? Respectfully, J. B. N.

Well-rolled slag would make an excellent foundation for macadam, and if good broken stone which binds well can be obtained at reasonable cost we would suggest, as the best solution, placing on the slag foundation a wearing surface of about three inches of stone broken to pass through a 1½-inch screen, rolled like any macadam. If slag is to be used in the top surface, our next choice would be the use of tar as a binder, care being taken to get a grade adapted to this use. Slag concrete is practicable, but would be rather expensive. For heavy teaming it should be at least four or five inches thick. It would probably be desirable to take particular pains to obtain thorough mixing, to make the concrete rather wet, and after thorough tamping to sprinkle the top with fine crushed stone to prevent dangerous slipperyness. The concrete should be put on in a single layer.—Editor.

NEWS OF THE MUNICIPALITIES

Divers Subjects of General Interest and Their Treatment by City Councils and Officials—Streets, Waterworks, Lighting and Sanitary Matters—Police and Fire Items—Government and Finance

Roads and Pavements

KNOXVILLE, TENN.—Street paving contracts, pending for more than two months, have been signed. The Mayor had failed to sign the contracts, although he did not exercise the veto power. The contracts were signed by John P. Murphy, Chairman of the Street Committee, and C. C. Nelson, Recorder, in accordance with the instructions of two-thirds of the City Council. Immediately after the signatures were affixed, officials and attorneys proceeded to one of the paving districts and saw the first load of material removed from the street.

METUCHEN, N. J.—Engineers of the Lehigh Valley Railroad Company have been put to work preparing plans for abolishing the grade crossing on Park Avenue. The company proposes to lower their tracks nine feet and ask the freeholders of the county to share with them the cost of a roadway bridge. This crossing has been considered as one of the most dangerous in the country.

TOPEKA, KAN.—Councilman Holliday introduced and the council passed his "Don't Hitch Horses on Kansas Avenue" ordinance and in the future horses will not be permitted to stand on Kansas avenue between Crane street and Tenth avenue more than one hour. The penalty for the violation of this ordinance is from $2.00 to $10.00. The paving company and other experts claim that the hitching of horses on the new pavement will shorten its life and that Kansas avenue may be kept much cleaner if horses are not permitted to stand on it for hours.

PASADENA, CAL.—A project which is considered as second only to the Owens River enterprise is being advanced by the Board of Trade by a novel method. The plan is a bond issue for the construction of many miles of boulevards connecting the towns of Los Angeles County. The method adopted is to send out letters containing return postal cards to the citizens of the county, so that they may express their wishes. The object is to place Southern California on a par or superior to Florida as a resort where driving and automobiling are leading features of the winter season.

SPRINGFIELD, MASS.—The Board of Public Works has recommended to the Board of Aldermen the widening and relocating of Peconsic avenue boulevard together with the construction of a stone bridge over Mill River. It is recommended that the macadamizing be done from time to time. Grading and filling may be done with ashes collected by the Health Department. This work will result in a beautiful boulevard approaching the South End bridge and the southern end of Forrest Park.

Sewerage and Sanitation

BALTIMORE, MD.—The method of taking care of private sewers, as well as the question of providing for the cost, is occupying the attention of the Sewerage Commission. Such sewers as are now being built are for storm water only, and empty into the harbor or adjacent streams. The Commission is prevented by law from turning any more sewage into these streams, and it will be several years before any sewage can be taken care of at the disposal plant. As regards the expense the Commissioners believe that the cost of diverting private sewers should come out of the tax levy.

BRIDGEPORT, CONN.—Council has passed a resolution authorizing Mayor Reynolds to appoint a Sewer Commission, consisting of four citizens, and the chairman of the Council Committee on Sewers, whose duty it shall be to formulate a new sewer system and estimate the cost of the same. Provision is made for the employment of a special engineer and assistants in order that the preliminaries may be completed and the work started without unnecessary delay.

EASTON, PA.—W. A. Folk, who has the contract for cleaning catch-basins, has made a claim of $95 for extra compensation with the 1905 contract, basing his claim upon the fact that the street flushing machine washed considerable mud and refuse into the inlets, and Folk was put to additional labor to remove it. He claims $20 per month as the cost of the extra work.

LOUISVILLE, KY.—The principal benefits expected of the city government during the coming year are: A comprehensive system of sewers; tuberculosis hospital; parental school; interior park for the southeastern part of the city; complete street sprinkling during the summer; cleaner streets; an improved Fire Department; better police protection; regulations for the sale of milk; underground wires; cheaper light; better building laws; summer concerts; completion of the Carnegie library; improved street car system; additional asphalt streets; annex to the City Hall; annexation of new territory; a filter purification plant.

NEW ORLEANS, LA.—A review of the work of cistern inspection, under the direction of Dr. William T. O'Reilly, shows that there are in the city 72,792 premises and 74,951 cisterns. Two hundred and forty thousand, five hundred and ninety-three inspections and reinspections were made, every premise in the city being visited not less than twice, others more frequently. The smallest number of working crews or gangs employed at any time was ten, and the largest number thirty. The average number employed during the ten months that the work lasted was twenty-six, and the average number of inspections per day for each working crew was thirty-five, let alone oiling and other incidental work connected with the service. Forty-nine thousand nine hundred and ninety cisterns were found defectively screened at various times, 100 tanks and over a thousand wells; 56 tanks, 489 wells and 18,252 vaults were oiled. The total cost of the service to the Board and city was, approximately, $40,000.

Waterworks

ALBANY, N. Y.—A water famine, accompanied by an average consumption of 240 gallons per capita, prevails at Albany. To a warning issued some time ago about the waste of water, the citizens paid no attention, and consequently the department has been obliged to reduce the supply from two reservoirs at night. This cuts off the water at night from the upper stories of buildings in some sections. The present consumption of water is 24,000,000 gallons in twenty-four hours, which is 4,000,000 above the normal. The total pumping capacity of the works is 15,000,000, and 5,000,000 are supplied by gravity. Men will be stationed at the reservoirs to turn on water in case of fire.

Altoona, Pa.—The Board of Public Works has leased the contract for farming the city filter beds for $350 a year. The filter beds comprise 56 acres of level surface and two acres of auxiliary beds, making 58 in all. The soil is rich, but it entails a great deal of work in farming it, for the weeds grow rapidly and if not kept down they soon get ahead of the crops and choke them out. City Engineer Harvey Linton believes that the filter beds offer an excellent opportunity for either the city or private individuals as an investment in peppermint raising. The plant thrives in soil fertilized by sewerage and is a very profitable crop in English sewerage farms.

Cheshire, Conn.—The New Haven Water Company has petitioned the Legislature for a charter authorizing it to take and utilize the waters of Ten Mile Brook for the purpose of a public water supply for Cheshire and other neighboring towns. The plant is estimated to cost $50,000 in addition to other properties already controlled by that company. A reservoir would have to be built in the town of Prospect, from which the water would flow by gravity.

Gloucester, N. J.—A movement is on foot to sell the municipal waterworks and use the proceeds to pay off the bonded debt of the city. Although the plant is considered a good one, the water rents during the past year have not equaled the operating expenses and the cost of repairs. Repairs and improvements costing several thousand dollars have been made during the past few montns and it is expected everything will be in working order in a few days.

Hamilton, Ohio.—For the first time in many years the water revenue fund has produced a surplus, and the Board of Public Service has turned over $6,000 to the Sinking Fund Trustees. Superintendent Thompson is in receipt of congratulations.

Jersey City, N. J.—In a report to the Jersey City Board of Trade, Dr. William H. Parke, who has been investigating the quality of the city's water supply, states that he regards the water as about as wholesome as that which most cities in the United States receive. A comparison with the Croton water, chemical and bacteriological tests of which were made of samples taken on the same days, showed that the two waters were quite similar. The death rate from typhoid fever of 18 per 100,000 for the last three years indicates that the water has been reasonably pure. While it is admitted that there is some pollution above Boonton, it is shown that the water in passing through the reservoir at Boonton and the twenty miles of pipe to the city so purified itself that little pollution remains.

Milford, N. H.—While the town's water supply seems ample for the present needs, reports from the farming districts in the vicinity would indicate that a distressing condition of affairs may arise in the near future from scarcity of water. Owing to the severe cold, the ground has frozen to a considerable depth, and it is feared the springs will not be supplied with water for some months.

New York, N. Y.—Borings have been made in the bed of the Hudson river, near Storm King Mountain, for a depth of four hundred feet without striking rock. It is feared that it may be necessary to change the proposed location of the new aqueduct from the Esopus watershed, as the engineers require a rock foundation, because the inside pressure on the aqueduct will be great and must be secured against leakage. In making the borings clay and silt were found for a depth of 130 feet; below came a stratum of shell rock, then clay, boulders, shell rock again, followed by clay, boulders and so on. Professor Kemp, of Columbia College, and Prof. Crosby, of the Massachusetts Institute of Technology, have been called upon as geological experts.

Lighting and Power

Baltimore, Md.—During the year 1907 the Subway Commission will put another $200,000 into new conduits for wires, and will greatly enlarge the district from which all overhead wires can be removed. No man who remembers the conditions downtown before the fire, as compared with the conditions of to-day, can doubt that the removal of the overhead wires is a great improvement.

Easton, Pa.—The municipal electric lighting plant has been in trouble. Failure to provide new machinery to keep pace with increased demands and provide a safe working margin left the plant in such a condition that when recently new lamps, which required more amperes of current than their rated capacity, were installed, the result was a breakdown. The lamps formerly used were of such an old pattern that they could not be used again owing to the impossibility of obtaining globes quickly. The consequence was that part of the city has been without light for some time, and a petition has been sent to the Select Council to turn the lighting problem over to a private corporation.

New Haven, Conn.—The purchase of the Connecticut Railway and Lighting Company, with all its rights and privileges in lighting and power plants, its franchises in many of the manufacturing centers, together with the railway system which was owned by the Rhode Island Securities Company, is one of the largest transactions ever made in New England. It is of immense importance to the New York, New Haven and Hartford Railroad Company, and it gives to that corporation control of about 1,350 miles of single trackage in trolley lines in Connecticut and Rhode Island, from which the gross earnings a year are upward of $16,000,000.

Morristown, N. J.—An indignation meeting was held in pursuance of a call sent out by Mayor Reed to protest against the electric light and gas supply. A committee of the Civic and Merchants Associations and the Lighting Committee of the Board of Aldermen was appointed to investigate the plant and consider whether municipal ownership would be advisable. Inability to obtain new machinery was alleged as the cause of poor electric service, and small gas main of unsatisfactory gas.

Peoria, Ill.—By the provisions of a new ordinance the Peoria Gas and Electric Company is given a franchise for forty years, for which in turn it agrees to furnish gas at a rate not to exceed ninety cents per 1,000 cubic feet, to readjust this rate every ten years if the council shall so desire, furnish free lighting to the City Hall and also free heating, free lights to the public library and the city bridge, thus effecting a saving of over $12,000 a year, pays all the expenses involved in the legal controversy, amounting to over $20,000, and within the fire limits will place all electric wires underground.

Skaneateles, N. Y.—The total cost of the village electric light plant has amounted to $28,743, of which $4,121 was paid out of the revenue from the plant. While the plant was not built for profit, but to supply light at a reasonable cost, it has paid all its operating expenses, extensions amounting to $5,700, interest on its bonds and $3,000 on capital account.

Syracuse, N. Y.—Members of the committee appointed by the Central Trades and Labor Assembly to endeavor to secure municipal ownership of gas and electricity plants in Syracuse reported yesterday that between 5,000 and 6,000 names had been signed to their petitions. The petitions are directed to the Common Council, protesting against the city's executing a new lighting contract with the Syracuse Lighting Company and to the Legislature for the enactment of a law to enable the people of the city to vote at a municipal election upon municipal ownership.

Fire and Police

ATHENS, GA.—A bill will be introduced in the next general assembly to provide for the organization of a rural police force for Clarke County. Public sentiment favors the bill, and the proposition is to have the county pay the bailiffs an additional compensation and have them perform police duties in their respective districts.

BALTIMORE, MD.—George R. Willis, President of the Board of Police Commissioners, is making a determined effort to stamp out the illegitimate cocaine traffic. Policemen have been instructed to visit every drug store on their respective posts and notify them not to sell cocaine without a prescription. "The evils of the cocaine traffic cannot be exaggerated," said Mr. Willis. "The illegitimate sale of the drug and its use by a certain class of negroes and whites is creating maniacs, paupers and disorderly characters. The police say they would rather deal with a half-dozen liquor-crazed men than with one man or woman who has been using cocaine."

CHICAGO, ILL.—Plans for the extension of the Fire Department, together with improvements to be made in the service, have been announced by Fire Chief Horan. Six new companies are to be added before the close of the year and ten new houses are at present under construction and will be completed before March 1, 1907. Training stables and hospitals for horses of the department will be established in the southern and western portion of the city and will be in charge of a veterinary surgeon.

COLUMBUS, O.—The army post has received from the Quartermaster's Department, at Chicago, Ill., a gasoline fire engine, which is the most important piece of apparatus the post has ever owned. The various fire companies are being drilled in its use and it is found that they can handle it easily.

LYNN, MASS.—Chief Thomas A. Harris of the Fire Department has been notified that the two engines ordered some time ago have been shipped. They will be placed in old houses in the section where the fire risk is greatest. The two smaller engines replaced will be placed with two new companies which will be formed soon. The purchase of these engines is one step in the direction of securing a reduction of insurance rates, as required by the New England Insurance Exchange.

NEW ORLEANS, LA.—Inspector Whitaker, on a recent night tour of inspection of station houses, found that many of the force were immune from insomnia. In three precincts policemen were found asleep in the stations and at other places on the beats. With a view to maintaining discipline the inspector has issued an order to the effect that corporals, after making their rounds, must enter on their blotter the names of each patrolman who was not in the round with a statement as to whether he was engaged in patrolling the beat or engaged in other special performance of duty.

Government and Finance

ARDMORE, I. T.—A popular suggestion has been made by a number of prominent men that a New City be established as a State Capital, geographically situated near the center of the State, in a beautiful natural spot, where the water supply would be ample. What is desired is a city laid out on modern plans, with wide streets and large park areas, so that the capital would be second to no other in the country.

BIRMINGHAM, ALA.—Mayors and other officials of the cities of Alabama of less than 25,000 population met recently for the purpose of securing better legislation affecting their government. A committee was appointed to draw up a bill. The general sentiment expressed in the meeting was in favor of more freedom in the matter of self-government and more power in levying taxes for local improvements. A resolution passed, putting on record opposition to any proposition to supplant present charters, but favored amendments whereby their powers would be extended. A motion was also passed favoring a bill increasing tax rates of cities of this class to one per cent. Mayor Charles P. Smith, of Gadsden, was chairman of the meeting. Other Mayors present were H. A. Skeggs, of Decatur, Thomas E. Kirby, of Anniston, W. N. Scott, of Ensley, Samuel Blackwell, of New Decatur, A. E. Walker, of Florence, Thomas W. Smith, of Huntsville, J. J. Sullivan, of Bessemer, and W. H. Blair, of Sheffield.

BOSTON, MASS.—A merchants' committee to investigate the city's finances has been proposed by Mayor John F. Fitzgerald, and has met with general approval. Mr. George F. Field, Chairman of the Boston Board of Underwriters, in an interview expressed doubt as to the competence of men of general business experience as compared with expert accountants to act on a committee of this sort. He believes that the right committee could bring about economies so that the city's business could be conducted for from 30 to 50 per cent. less than now, with equally good service. It is also desired to ascertain whether current expenses are being charged to the future.

EAST ORANGE, N. J.—Having found that its charter, which it obtained from the Legislature seven years ago, requires almost constant amendment, and that the procedure established by it is expensive, the city of East Orange will ask the Legislature for a new one. The chief objection is the excessive amount of advertising required for all public improvements, as well as the method of levying assessments.

EVANSVILLE, IND.—As a sequel to the conference of municipal executives called together by Mayor Bookwalter, of Indianapolis, Mayor Boehme, of Evansville, has given out the following information. According to a law which it is proposed to pass in the next Legislature, liquor licenses are to be increased to $1,000 and the increased revenues turned over to the county governments. The mayors maintain that as the city governments pay the entire cost of police protection and a large part of the time of the police is spent in guarding places where there are many barrooms, that the increased revenue should go into the city treasury. The mayors will appeal to the Legislature to have this change made.

PROVIDENCE, R. I.—At a recent conference with the Aldermen-elect, Mayor-elect McCarthy proposed the creation of a committee with power to inspect the books of the gas, telephone, electric light, street car and other quasi-public corporations; the establishment of the office of a public weigher of coal; a revision of the transfer system; legislation prohibiting members of the city government from doing any outside business with the city in a commercial line, and sundry other measures.

Refuse Collection and Disposal

HARRISBURG, PA.—The matter of garbage disposal is under consideration. When the city opened bids a couple of years ago for the work to be done at contract the bids ranged from $28,000 to $60,000. It is estimated that from $30,000 to $40,000 will be required for a garbage plant should the city decide to establish one. The assessed valuation of the city is likely to be increased from raising the assessment on central property and the increased revenue applied to the cost of a garbage plant.

LEADVILLE, COL.—Some time ago the city scavenger was let go and since then very noticeable neglect has developed on the part of private scavengers and citizens in depositing their refuse on the city dumping grounds. The refuse has been scattered all along the road leading to the grounds, and the health of the community is endangered

by the reckless manner in which the garbage is distributed over the territory between the city limits and the place designated for depositing the stuff.

Massillon, O.—The question of how to keep the streets cleaner without an increase of cost was the subject of recent discussion among city officials. The suggestion was made that the street cleaners might make use of fire department horses for hauling the street sweeper. The statement was made that at Canal Dover this method is in use and that the street sweeper work gives the animals the exercise they need.

Youngstown, O.—City Health Officer Dr. H. E. Welch is of the opinion that garbage, instead of being removed by private collectors, should be collected by one contractor under the supervision of the Health Department. The cost of such collection, as ascertained by a committee visiting Cleveland, was found in that city to amount to $2 per ton. Naturally, the cost would be higher in Youngstown, but $5 is put as an outside figure. Chairman of the Board of Public Service Heintzelman favors collection by the city, especially as it owns the crematory. He believes the cost would be no greater than by the contract system, and the serivce superior.

Parks and City Beauty

Baltimore, Md.—Speaking of contemplated improvements of the city in 1907, Mayor E. Clay Timanus says: "Baltimore has a park system of which we are proud, but this system will be considerably extended next year. Additions are already being made to Carroll and Patterson Parks, while Wyman Park, in the valley of Stony Run, is being developed and a fine boulevard along Thirty-third street to connect Wyman and Clifton Parks is projected. The Gwynn's Falls Park is beginning to assume shape, and smaller parks and playgrounds are to be developed here and there in the growing districts. The amount of money available is limited, but there is another $1,000,000 loan coming, which will be sufficient to round out most of the plans." In other ways great strides are promised along the line of modernizing the city, and plans that have been under consideration for decades will be carried out this year. Altogether $17,000,000 have been appropriated for improvements.

Sacramento, Cal.—City Trustee Carragher is making a fight against bill-boards. The matter of the excessive size of these boards was called to his attention by a citizen who, after erecting a little cottage on a forty-foot front, found himself hedged in on both sides by bill boards eighteen feet high and extending along the street a hundred feet each way. Under the city ordinances there seemed to be nothing he could do, and therefore Trustee Carragher thinks the law should be changed so as to limit the size of bill boards.

York, Pa.—The first move in the plan to make York the "City Beautiful" was made recently, when under the auspices of the York Assembly of the Dauphin Institute, assisted by public-spirited citizens, Prof. Zueblin of Chicago University, delivered his lecture on the "Twentieth Century City" or the "The City York Ought to Be." Prof. Zueblin would have the city by its regularly constituted bodies or through its public spirited citizens, lay out a definite plan of action, a plan that would provide for parks, sewers, the elimination of poles, the beautifying of the lawns, the prevention of corporations from doing as they please in tearing up streets, street car congestion in the public square and a hundred and one every day, common sense remedies that most citizens have long been aware of, yet fail to get at the foundation of, for lack of a general plan of action. Prof. Zueblin would have the city fathers, official or real, decide on what they want in the years to come and then "go after it" so that the future generations may take up the work that has been started and carry it to completion.

Rapid Transit

Cleveland, O.—The most sensational move in the great street railroad war was executed by the Municipal Traction Company, operating the Forest City Railroad Company, on December 26. Preceding this move was the granting of a permit for the laying of temporary tracks on Superior avenue, at a special meeting of the Board of Public Service following a regular evening session of the Council. To take immediate advantage of this action the Traction Company had men, teams and materials located at strategic points along the proposed line and at midnight, when the word was given, the forces moved to their allotted positions, laid the track on top of the present pavement, put up temporary poles, and before many hours had passed the 3-cent line was operating cars to the Public Square.

New York, N. Y.—The three years' deadlock over the granting of a franchise to the New York Connecting Railroad, was ended when Mayor McClellan and Third Vice President Rea reached the agreement that the railroad should pay $100,000 more than provided for in the original terms. This brings the total price of a 25-year franchise up to $1,237,500. This road will connect the Pennsylvania and New Haven roads by a belt line running around Brooklyn and Long Island City and is estimated to cost $20,000,000.

Schenectady, N. Y.—As a result of a general investigation of street car speeds the old limit of 8 miles per hour was found to be entirely unsatisfactory, and an ordinance was passed by Council permitting a speed of 15 miles per hour in a certain downtown area and a speed of 20 miles per hour on suburban lines. At all corners of 90 degrees or less, a speed of 3 miles per hour is permitted. In a series of tests made with a 12-ton car upon practically level straight track it was found that the maximum speed was 22 miles.

Miscellaneous

Kansas City, Mo.—Alderman John F. Eaton's resolution for the appointment of a commission to revise the building laws has been unanimously adopted by the upper house of the City Council. Accompanying it was an ordinance limiting the height of buildings to twelve stories. The commission to revise the building laws is to consist of the Superintendent of Buildings, the Fire Warden, two members of each house of the Council, one experienced builder, one experienced architect and a representative of the Missouri Board of Fire Inspection and Surveys.

Philadelphia, Pa.—A crisis in the cement industry has arisen within the last few weeks. After six years of litigation, a few of the largest manufacturers have obtained control of every coal burning device known to the cement industry. They claim a royalty on all cement manufactured by coal burning processes. As their claim might put out of business plants representing an investment of 50 millon dollars, a committee has been appointed to try to arrange satisfactory terms. Cement manufacturers in the gas belt are not directly affected, but they fear that so many manufacturers would come to their district as to affect the market unfavorably in the territory they can supply.

Trenton, N. J.—While no formal announcement has been made by the City Hall Commission as to the site selected for the new municipal building, it is accepted as a certainty in both political and real estate circles that the northeast corner of Clinton avenue and State street has been agreed upon. A plan of this plot has been prepared by interested property owners and presented to the commission, and the land necessary for the City Hall has been offered for $137,000.

MODERN INSURANCE ENGINEERING

Increasing Interest in Fireproof Construction—Modern Buildings Good Fire Risks—Influence Exerted by Insurance Companies and Engineers—Lessons from Large Conflagrations

By GEORGE E. WALSH

THE technical side of insurance engineering is greatly emphasized by such conflagrations as the San Francisco fire, and, aside from any special considerations to include protection from earthquake shocks, the subject gains in importance with the publicity given to the reports of individual buildings which withstand the destructive effects of the fire. The rather appropriate epithet of "combustible America" has been applied to this country in the past, but its application is limited more to special sections of the country where wooden frame buildings have been constructed in the past or cheap masonry structures of a flimsy nature. The types of modern fireproof buildings erected in such cities as New York and Chicago are not surpassed in the world in their comparative immunity from fires, and the relative protection which they afford to neighboring blocks of cheaper buildings greatly reduces the insurance hazard in their neighborhood.

The rebuilding of our cities has for the most part been along lines of improved fireproof protection, and eventually the cheap firetrap blocks must disappear. The cost of lumber has increased so rapidly that its general use for building purposes must decrease, and coextensive with this has been the cheapening of manufacture of such fireproof building materials as terra-cotta tiles and blocks, cement blocks, fireproof bricks, and many patented fireproof compositions for floors, partitions, and walls. Already the difference in the cost of building wooden houses and those of brick, concrete, and terra-cotta is so slight that the former is rapidly going out of favor. From an insurance and investment point of view the fireproof house is far more profitable than any other, and when this fact is more generally understood and appreciated owners will resort less and less to any questionable type.

A general lack of uniformity in the building laws of our cities has been one of the stumbling blocks in the way of the modern fireproof movement. The large building construction companies operate to-day in nearly all of the leading cities, and the tendency is toward the adoption of certain types of structures in all sections. Economy of construction demands uniform building laws so that the steel work and fireproofing material can be manufactured in large plants to be shipped direct to the building site for rapid assembling. Where building laws are changeable and not up to date, it is impossible to operate by this method successfully. In some cities materials are admitted as fireproof, which in others are condemned and not permitted in certain types of structures. A radical difference also exists in the method and nature of fireproofing steel columns and girders so that structural engineers in estimating on plans must study local building laws and adapt their figures and drawings to suit them.

Modern insurance engineering aims to secure general uniformity of building laws and to classify different materials in regard to their fireproofing qualities for all cities alike. The various testing stations in our large cities have already secured substantial results in this direction. These tests are being conducted to-day by experts not interested in the manufacture of any material, and the reports should secure for owners and builders better protection from inferior fireproofing methods.

An indication of the growing interest in this subject is shown by the new course in fire insurance engineering established in the New York University School of Commerce, Accounts, and Finance, opened in September of this year. This course will include instruction in inspecting, fire protection, and adjustment of losses and risks. Inspection of building materials and methods of constructing fireproof and non-fireproof houses, mills, and offices, as well as thorough instruction in the use and designing of standpipes, chemical extinguishers, automatic sprinklers, and automatic fire alarms, will be included in the course. The students will thus secure through proper experts the latest scientific methods of building uninfluenced by politics or unscrupulous exploiters of doubtful fireproof materials.

The advance in fireproof methods of building has been considerable in the last few years, and the insurance engineer has been an important factor in the situation. The insurance on modern structures costing a million or two of dollars represents an annual dividend on large investments. The tendency of insurance rates to advance is a matter, therefore, of grave concern to business and manufacturing corporations. It is so important a factor in the situation that many companies and owners of property carry insurance to cover only a part of the buildings, preferring to take the risk of losing something in a fire to paying premiums on large policies. Reduction of the insurance risk is a matter which touches the greatest number of manufacturers and owners of private property.

MODERN BUILDINGS GOOD FIRE RISKS

The discrimination between good and bad risks has been carried on vigorously by the underwriters in the past few years, and the insurance engineer is working in the interests of both the property owners and insurance companies. The modern approved type of tall office building, apartment house, or hotel is an excellent risk for the companies in spite of the complicated systems of electrical wiring, steam pipes, gas, and power engines installed therein, and the premium rates for such structures show as decided a tendency to go down as they are advancing in undesirable houses. Some of the most

recently built fireproof structures have gone so far as to take out no insurance protection, but are carrying their own risks on the theory that the buildings are so nearly fireproof that no great loss could ever happen to them from an interior or exterior fire. Others have been insured for a comparatively nominal sum, sufficient only to cover damage that might be caused by a fire confined to a single floor.

The elimination of nearly all combustible material from these modern structures makes the danger of a disastrous fire very small. With standpipes and automatic sprinklers installed in the buildings, the danger of an interior fire getting much headway is almost inconceivable. Where nothing more than furniture and the ordinary stock of office equipments are stored on the different floors of a modern skyscraper, the heat generated by an interior fire on any floor should not reach a temperature sufficient to destroy the terra-cotta fireproof protection and seriously injure the steel structural work. The repairs necessary for rebuilding after such a fire, if thus confined to walls and ceilings of a single floor, are not costly. It is only when the steel work is weakened so that it must be replaced that the work is expensive. The modern method of protecting the steel frame with hollow porous terra-cotta tiles and blocks has proved beyond question that no great fire from the interior could seriously injure the beams, columns, and girders carrying the load.

With fireproof floors, ceilings, and partitions, the problem of confining a fire to a single floor, or possibly to a single room, has been greatly simplified. The ability of the walls and partitions to withstand a temperature of 1,500 to 2,000 degrees without crumbling or conducting the heat so as to cause a fire on the opposite side has given insurance engineers more confidence in the tall office buildings even when reared far above any possible reach of water supplied by the fire department. In the early days of the skyscrapers the insurance hazard was viewed by underwriters with considerable anxiety. It is a noteworthy fact that many of the companies either refused to insure such tall buildings or advanced rates to meet the special danger; but to-day the tall office building, constructed on scientific fireproofing lines, is considered one of the best risks. Most insurance companies bid eagerly for the business of such buildings. The change is due both to the improved methods of fireproofing and fire-fighting equipment installed in the structures. The automatic sprinklers and standpipes have made the danger less real than ever before.

Good Influence of Insurance Companies

The insurance companies in assuming risks on buildings make a pretty thorough examination of the structures and the surroundings. To-day the construction of a large building is inspected regularly by insurance engineers while in the process of going up. In order to secure exact data regarding the fireproofing this method is considered the easiest and safest. If proper fireproofing work is not adopted and carried out in detail, the leading underwriters are made acquainted with the fact, and when the owner comes to apply for insurance he is confronted by some embarrassing questions and facts. The building department may officially pass upon the building, but the insurance underwriters are not governed by the building department's inspectors' work. Their own experts are relied upon to furnish them with data.

So it is that we find owners of buildings and the insurance companies often at odds about the risks. The latter classify their buildings into fireproof and non-fireproof, and many owners who may claim for their property absolute protection from fire find that the insurance companies place them in the latter class. Before the risk is assumed a surveyor and insurance engineer makes an examination of all the fire-fighting appliances and the surrounding exposed buildings. The exposure hazard is an important one. A modern fireproof structure built in the midst of cheap firetraps is not considered a good risk, for the danger from an exterior fire of great proportions is ever present. A tall fireproof building in a congested quarter always tends to improve the insurance risk for surrounding property, but the latter, if of old and poor construction, decidedly injures the insurance risk of the former.

The united action of the fire insurance companies in reaching some fixed rates of different risks and in distributing insurance so that individual companies cannot be wiped out by a large fire has met with general approval; but the concentration of effort to secure certain standardization of building methods and materials is of even more fruitful results. Not all of the insurance companies act in concert yet, but insurance engineering as a profession is steadily bringing the leading companies together in demanding certain uniform methods of construction. Much that has passed for fireproof in the past has been misleading, and until the underwriters make hard-and-fast rules concerning the value of different building materials there will be more or less skimping of many fireproof buildings.

This was well illustrated in the Baltimore fire. Steel structures protected by good terra-cotta material showed comparatively little injury to the framework. In the twelve-story Calvert building the loss to the steel framework was only 1.37 per cent., and in that of the eleven-story Union Trust Company's building only 1.03 per cent. Both of these buildings had their steel framework protected properly with terra-cotta tiles and blocks. On the other hand, the covering of the steelwork of the Equitable Building was skimped to such an extent that the floor arches collapsed and the structural ironwork was damaged over 43 per cent.

The National Fire Protection Association committee, after an exhaustive examination of the conditions after the Baltimore fire, reported that "generally speaking, the steel frames withstood the fire in proportion to the degree of excellence of the fire-protective coverings applied to the various members. Where this covering was deficient or was entirely absent the steel or iron framing was frequently distorted." This report was made, notwithstanding that innumerable evidences were found in the Balti-

more fire indicating temperatures of from 1,600 to 1,800 degrees Fahrenheit, and possibly 2,000 to 2,100 degrees over limited areas for a short time. In actual tests steel columns will commence to yield under loads at temperatures of from 1,000 to 1,200 degrees F., and castiron columns unprotected will generally succumb under loads at temperatures ranging from 1,300 to 1,500 degrees The chances of iron or steel framework carrying the load safely in an ordinary fire are thus very slim unless adequately protected by trustworthy fireproof material of proper thickness.

The San Francisco conflagration, in spite of its disastrous extent and great territory covered, will yield less definite data for the insurance engineer than the Baltimore fire owing to the comparatively few modern fireproof structures erected in that city. The insurance engineer had hardly made his influence felt in San Francisco prior to the earthquake and fire. It is sufficient to note the fact, however, that in the rebuilding of the city the insurance engineer will have more to say than any other expert, for the insurance companies, thoroughly aroused to the necessity of their own protection, will depend upon their own engineers for advice and data.

Function of the Insurance Engineer

The insurance engineer is practically a product of recent times, and his profession offers a fertile field for the efforts of the best minds. The work demanded of such experts is of unusually technical nature. It includes a thorough knowledge of structural work, trained abilities, in inspecting buildings, and a thorough familiarity with the relative virtues of the different fireproofing materials placed on the market. The application of the different fireproofing materials in the buildings is also a matter which calls for the best expert advice, and the insurance companies, relying upon their own engineers, must secure talent of a high order. The protection of steel frames with terra-cotta or concrete depends for its value upon the character, thickness, and general application of the materials. Skimping of the protection or inferior workmanship may nullify most of the good sought. It is the duty of the insurance engineer to see that grade, quality, and application are all within the specifications demanded by the underwriters' association.

Both architects and builders have many times in the past shown culpable ignorance in specifications for fireproofing. In the desire to construct the buildings as cheaply as possible the tendency has been to keep just within the building laws, and these in many cities are so vague that a wide latitude is left for individual builders and designers. Not a few contracts for fireproof buildings, which are in other respects model structures, read something like this: "All columns and exposed girders to be covered with terra-cotta, to conform to the building laws, and to make a good surface for plastering." Unless the building laws are strict and specify in detail the nature and thickness of the steel protection, the builder can skimp on the fireproofing material so that in a very hot fire the metal part of the building would expand, warp, and eventually collapse.

In his more varied work the insurance engineer must understand the nature of different State insurance laws, adjustment of losses, the conflagration hazard, electrical and other hazards, duties and obligations of insured and insurers, and general classification of risks; but none of these exceed in general importance the need of a complete and thorough knowledge of the relative value of different fireproofing methods and materials. In this field he is acting in the interests of the public, property owners, the insurance companies, and the honest builders and architects. By his special training he can discriminate while in the course of construction between absolutely fireproof and semi-fireproof buildings.

To the ambitious young man the profession of insurance engineering offers a field of great usefulness, which must continue to increase in importance as the movement for fireproof buildings in our cities spreads and grows. The remuneration for such services is already quite large, and for the future the promise is even greater. Comparatively few experts understand all phases of this important profession, or if understanding them they suffer their expert knowledge to be eclipsed by prejudices in favor of one or more methods of construction. The insurance engineer must rise above all petty preferences for certain fireproof materials or their application, and keep an open, unbiased mind ready for the proper consideration of all that goes to make our homes and public buildings proof against our greatest enemy.

Fire Protection for Small Towns

Suggestions made by Councillor T. C. Menlove, of Verden, Manitoba, at a recent convention, cover the question of village fire protection. According to the source of water supply plans must vary, but in any event there should be storage tanks of wood or concrete near the points of greatest risk. The bottom of these tanks should not be more than twenty feet from the level of the street and the manhole should be large enough to permit cleaning. As to apparatus a hook and ladder truck carrying a couple of wall ladders extending from 26 to 30 feet, 100 pails and two hand fire extinguishers are of the first importance. A small 2-cylinder, 50-gallon chemical extinguisher, with drop bottom for dumping acid, is capable of putting out 80 per cent. of all the fires that will occur. Of engines for pumping water the steam fire engine takes the lead, but the expense of maintenance of a gasoline engine is less and it is accordingly recommended. The use of a hose wagon is recommended because quicker work can be done and it keeps the hose in better condition than when wound on a reel. The personnel of the Fire Department should not be neglected and the chief should not only be an experienced man, but should be so favorably known that his men will have confidence in him and carry out his orders with alacrity. It might be well for the towns on this side of the border also to take notice.

SEWAGE TREATMENT AT WORCESTER

Statement of Results Obtained and Conclusions Reached After Fifteen Years' Service—Effectiveness of Plain Sedimentation

Scores of descriptions of the construction of sewage disposal plants have been printed, but the exact statements of the operation of these plants for a series of years are notably few. All the more welcome, therefore, is the presentation by Harrison P. Eddy and Almon L. Fales of several features of the working of the Worcester, Mass., plant, given in a paper read in October before the Boston Society of Civil Engineers, and published in the journal of the Association of Engineering Societies.

The sewer system contains 72.95 miles of separate sewers and 62.248 miles of combined sewers draining to the disposal works. The plant contains 16 settling basins, one of which was used as a sedimentation basin and one as a septic tank; 36 acres of sand filters, besides lime and sludge tanks, filter presses, etc. The sand filters have received crude sewage and the effluents from the chemical and septic treatments, and from simple sedimentation. The sewage contains large quantities of manufactural wastes, notably that from tanneries and wire-drawing establishments.

Plain Sedimentation

Preliminary sedimentation in grit chambers has been effected since 1904 in two chambers, each 10 feet wide and 40 feet long, and containing 9 feet depth of sewage and silt. With quantities of flow up to about 15,000,000 gallons in 24 hours, too much organic matter settles out if both basins are in operation. When rain water increases the amount beyond this, however, both tanks must be used to insure the collection of substantially all the sand and gravel. Very offensive odors are given off by the deposit while being removed and after being spread on the dump.

During 1902-3 experiments were made to ascertain the degree of purification attained and the quantity of sludge deposited by sewage passing at different rates through a basin 40 feet wide by 166 2-3 feet long by 7 feet deep. Three dams, each 2 or 3 feet high, were built across the basin, dividing it into four equal compartments; and directly over each was a screen board extending 18 inches below the surface. Sewage entered through apertures 12 inches apart and 18 inches below the surface, and left through a submerged slot. In order to prevent septic action the water was drawn off every 4 to 8 weeks, according to the weather, and the sludge measured, removed and analyzed. When the flow was 300,000 gallons a day, 3,610 gallons of sludge, or 0.95 tons of solids were deposited per million gallons of sewage treated; when the flow was 500,000 gallons per day, the deposit was 3,282 gallons of sludge, or 0.74 tons of solids; when it was 750,000 gallons per day, the deposit was 1,671 gallons of sludge, or 0.39 tons of solids; and when it was 1,000,000 gallons per day, the deposit was at the rate of 1,614 gallons of sludge, or 0.24 tons of solids, per million gallons of sewage treated. These are all average figures of from two to five months' tests at each velocity. At the rate of 1,000,000 gallons a day the amount of sludge was but 33 per cent. as great as that from sewage previously treated with lime and flowing through the settling tanks at the same rate.

It was concluded that the volume of sludge and weight of solids therein vary inversely as the rate of flow through the settling basins; and that the quantity is always less than if preceded by chemical treatment.

Chemical Precipitation

Pickling liquids are present in Worcester's sewage to such an extent as to very materially affect the sludge produced in the settling basins. They supply in themselves sufficient copperas, so lime only is added, the iron then being thrown out of solution in the form of a flocculent precipitate which carries to the bottom with it the suspended matter in the sewage. The combination forms the sludge, the amount and character of which vary from hour to hour with variations in the amount of dissolved iron present. The recent addition of grit chambers,

Data on Sludge Resulting from Chemical Precipitation

Year	Average Flow of Sewage Treated in Million Gallons per Day (365 Days)	*Lime Used in Chemical Treatment Lb. per Million Gallons Sewage Treated	Volume of Sludge Pumped from Settling Basins		Solids in Sludge Pumped from Settling Basins	
			Gallons per Million Gallons Sewage Treated	Relation to Volume of Sewage Treated	Per Cent. of Solids in Sludge	Tons of 2,000 Lb. per Million Gallons Sewage Treated
				Per Cent.		
1891	3.83	965	15,760	1.6	1.33	0.88
1892	2.30	1,079	13,780	1.4	1.33	0.76
1893	4.92	1,170	10,970	1.1	2.88	1.31
1894	12.49	941	10,280	1.0	2.88	1.23
1895	15.70	1,030	11,600	1.2	2.88	1.39
1896	16.00	1,212	11,060	1.1	2.61	1.20
1897	17.00	1,130	10,730	1.1	2.61	1.17
1898	17.68	1,073	7,820	0.8	2.61	0.85
1899	16.35	1,204	11,230	1.1	2.99	1.40
1900	10.10	1,373	11,260	1.1	4.42	2.08
1901	8.58	1,498	8,638	0.9	4.85	1.75
1902	12.54	1,005	4,935	0.5	7.41	1.52
1903	14.39	871	4,809	0.5	7.23	1.45
1904	11.55	1,005	6,392	0.6	6.24	1.65
1905	10.11	999	4,950	0.5	8.28	1.71

* Lime added to sludge to facilitate pressing not included.

which catch the road detritus after storms, results in the amount of sludge being more uniform than previously, however. In order to prevent the removal in the effluent of an abnormal quantity of suspended solids, caused by septic action, it has been found advantageous to remove the sludge from the roughing tanks about once in two weeks, and from the finishing tanks about once in four weeks. (In Providence, R. I., removal at least once a week is found necessary.)

Various statistics of the operation of this plant during the past fifteen years are given in the preceding table.

Since 1900 the sewerage system has been partially changed from the combined to the separate, and a certain amount of untreated sewage has been turned directly onto the filter beds.

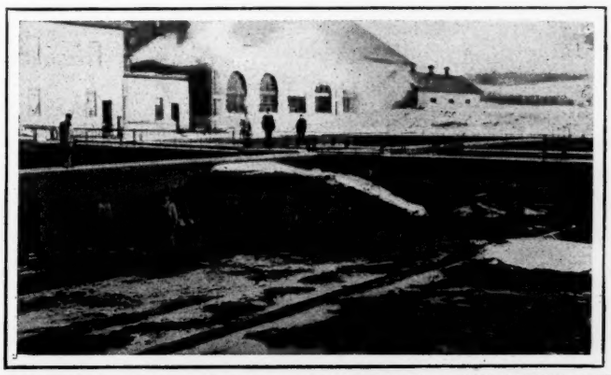
Since 1898 the sludge has been pressed into cakes, the average amount of which has been 5.7 short tons per million gallons of sewage treated. These cakes contained an average of 29.2 per cent. of dry solids (this having increased from 27 per cent. the first two years to 30.5 the last two), and amounted to 1.59 short tons per million gallons of sewage. The lime added to the sludge, to facilitate pressing it, has averaged 28.3 pounds per thousand gallons of sludge, or 176.5 pounds per million gallons of sewage, these increasing from 11.1 and 93.6 pounds in 1899 to 53.5 and 265.1 pounds in 1905. The cost of pressing, hauling and dumping sludge has averaged $5.69 per million gallons of sewage, or $3.64 per ton of dry solids in the cakes.

It is concluded that sludge from chemical precipitation is more voluminous and of greater net weight than that from septic or plain sedimentation; that iron in solution largely increases the volume; that sludge from chemical precipitation decomposes with the evolution of gas much like septic sludge; that sludge is most expeditiously pressed when it has reached a density of from 4 to 7 per cent. solids and is comparatively fresh, although 20 to 30 pounds of lime per 1,000 gallons must even then be added to assure economical pressing, and 100 pounds if there is much putrefaction, or if it is sludge from plain sedimentation. (In Providence this never exceeds 60 pounds.)

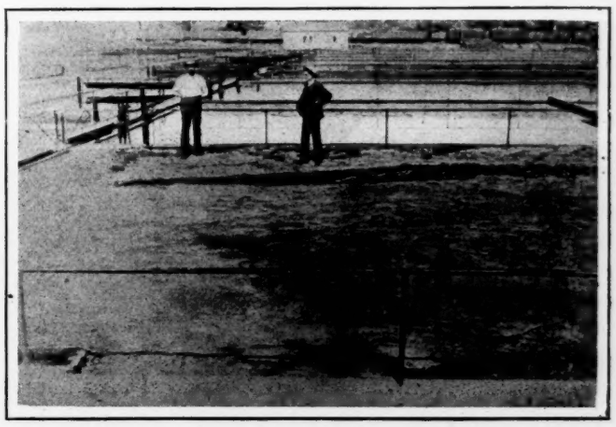
Septic Treatment

A tank similar to that used for plain sedimentation was used as an open septic tank, except that during the first experiment there were no sludge dams nor scum boards. The following phenomena are noticed at Worcester: "Soon after the septic tank is put into operation, if the weather is warm a thin film of oil is noticeable on the surface of the water. The sludge which is brought to the top of the basin by the gases entangled in it is surrounded with a film of grease, which assists in retaining it at the surface. The film of oil also prevents the free liberation of the gas from the water, so that there soon forms a thin coating of sludge and grease containing much gas which has been liberated from the sludge. If a severe wind storm or rain should take place under these conditions this thin film of scum would be broken up, the gas liberated and the solid matter driven to the bottom of the basin, and this may account for the frequent failure, under certain conditions, of the septic process to produce scum. During cold weather the grease upon the surface is congealed, so that there is no film of oil on the surface to assist in the formation of a scum." As the scum accumulates the upper part becomes dense, tenacious and tough, especially if exposed to sun and wind; but the under side contains large quantities of gas, which causes it to float well above the water. It seems probable that the presence of a large quantity of coarse particles may be an important factor in scum formation. It is thought that there is little septic action taking place in the scum.

While chemical precipitation produced 4,872 gallons of sludge per 1,000,000 gallons of sewage, and sedimentation produced 2,544 gallons, there was found in the septic tank 792 gallons per 1,000,000 gallons of sewage after nine months, and 304 gallons after a thirteen months' run (a large part of this would undoubtedly have become liquefied if the run had been continued for a longer time). Comparing the total suspended solids in effluent, scum and sludge, chemical precipitation increased these 39 per cent., sedimentation reduced them 5 per cent., and septic action reduced them 20 per cent. The fact that with sedimentation the solids were reduced 5 per cent. (part of which may have been really errors in measuring and sampling) indicates, what was realized to be the case, that there was some septic action in these tanks in spite of the frequent cleaning out. If we compare the totals



REMOVING HEAVY DEPOSIT FROM PRECIPITATION BASIN BEFORE GRIT CHAMBERS WERE CONSTRUCTED



SCUM ON SEPTIC TANK. MEN ARE STANDING ON THE SCUM

SURFACE OF FILTER, WHICH HAS RECEIVED CRUDE UNSETTLED SEWAGE

REMOVING CLOGGING FROM SEWAGE, WHICH HAS RECEIVED EFFLUENT FROM CHEMICAL TREATMENT

of sludge and scum only, chemical precipitation produced 248 per cent. as much as sedimentation, and the septic tank 28 per cent. as much, or 11.2 per cent. as much as chemical precipitation. Part of the septic sludge was precipitated iron originally in solution in the sewage; the reduction in organic matter was therefore greater than 20 per cent.

Filter Beds

The suspended matter in sewage which passed directly from the grit chambers was much coarser than that from the sedimentation tank, and formed a mat on the surface of the filter, which mat prevented the finely divided particles entering the pores of the sand. In sedimentation effluent there was not nearly so much of this coarse matter, but a mat gradually formed from fibrous particles; the fine matter penetrated the sand to a depth of one to two inches. As the fiber mat increases in thickness and density it retains more of the finer suspended matter, and finally the water refuses to pass readily through it. The mat must then be removed; which is generally done by raking, but it can sometimes be rolled up like a carpet (see illustration) when formed by crude sewage. Care was taken not to mix any of the mat with the good sand underneath. Also the mat was not removed in freezing weather, for then two or three inches of frozen sand adhered to and was removed with it. Beds filtering crude sewage required raking at least once in two weeks. The refuse removed has amounted to 14 cubic yards per millions gallons of sewage treated. The average amount filtered per acre per day was 91,000 gallons of crude sewage.

Effluent from chemical precipitation contains less suspended matter than other effluents, but more of it penetrates deeply than of those just mentioned. At times precipitated lime formed a hard crust, which was broken up with a horse wire-tooth weeder, and ceased to give trouble. It was found that partial removal of clogged sand accomplished little more than did resting. After treating 174,000 gallons of effluent per day per acre for one year the sand was clogged to a depth of 1.5 inches, which was then removed entirely, the sand beneath being comparatively clean. About 3.56 cubic yards of dirty sand was removed, at a cost of $1.62½, per million gallons filtered, 5.6 per cent. of this being organic matter.

Septic effluent contained much less suspended matter in cold than in warm weather; probably due to the less violent septic action during the former period. The addition of the scum boards and dams reduced the amount of suspended matter by about 6 per cent. The suspended matter was very finely divided and penetrated the sand to a considerable depth; it also gave off offensive odors. In the discussion Mr. Carpenter stated that at Pawtucket he made special effort to avoid the mat formation in winter, believing it rendered the sand liable to freezing, and furrowed the beds as additional precaution. He sets 50,000 to 60,000 gallons a day as the maximum dose per acre of their beds. Professor Winslow called attention to the fact that filtration produces as much sludge as any other process. Brockton, Mass., takes from the beds there nearly six tons of sludge per million gallons of sewage filtered.

Referendum and Initiative

The significance of an article which appears in *The World To-day,* from the pen of William Macleod Raines, "The Referendum at Work," is that in Oregon alone is the adopted system of initiative and referendum complete and effectively simple. To study it there is to study our best example of it. Thus, Nevada has a referendum but no initiative, in Utah the initiative is dependent upon legislative enactment, and so in other States the system has been handicapped or crippled. By the Oregon system, eight per cent. of the legal voters may propose a law or an amendment to the constitution. If a majority of the votes cast are in approval, the measure is self-operative and requires no legislative action. A five per cent. petition will refer to the people a bill passed by the Legislature, and the Governor has no veto power over the decision of the voters. In the election of June last the system was extended to ordinances in cities and towns and to all local and special legislation. Oregon cities and towns can now enact and amend their own charters, subject to the constitution and the criminal laws, without legislative interference. The article is specially significant and timely in view of the widespread interest now manifested in the subject by municipal officials.

THE DISPOSAL OF MUNICIPAL WASTE

Systems and Methods, with Special Reference to American Conditions—List of Garbage Crematories in Chronological Order

By W. F. MORSE, Sanitary Engineer

This Series of articles, begun in the February number, will be continued until completed, and will be illustrated by original drawings, cuts, diagrams and pictures, and contain many tables valuable for reference.

TABLE XXXII.—CHRONOLOGICAL LIST OF AMERICAN MUNICIPAL GARBAGE FURNACES SINCE 1885

	Date of Con-s'tion	No. of Fur-n'ces	Location	Type of Furnace or Name of Builder	No. of Patent	Contract Price or Cost	Capacity in 24 Hours Yds.	T'ns	Date of Dis-con-tin'ce	Remarks
1	1885	1	Gov. Island, N. Y.	Lt. H. I. Reilly, U. S. A.	.....	$300	....	....	1904	First Garbage Furnace in U S.
2	1885	1	Allegheny City, Pa.	L. P. Rider	352,653	5,700	....	30	1893	"Beehive" pattern. First municipal furnace in U. S
3	1885	1	Montreal, P. of Q.	Wm. Mann	371,203	.....	.....	....	1886	First Can'an fur.; for n't s'l only
4	1886	1	uWheelig, W. Va.	M. V. Smith	.....	.....	....	60	.....	Fuel, natural gas; still in use.
5	1886	1	Montreal, P. of Q.	Wm. Mann	371,203	.....	.....	....	1891	Second Canadian furnace; for refuse and garbage.
6	1887	1	Des Moines, Ia.	Andrew Engle	372,394	.....	50	....	1891	Replaced by Engle, No. 31.
7	1887	1	Milwaukee, Wis.	Forestal	.....	.....	.....	....	1888	Replaced by Engle, No. 9.
8	1887	1	Pittsburgh, Pa.	Rider Furnace Co.	.....	3,700	75	30	1901	Fuel, natural gas.
9	1887	1	Milwaukee, Wis.	Engle S. & Con. Co	.....	.....	.....	....	1889	Followed by Merz Red'n Proc's.
10	1887	1	Minneapolis, Minn.	Engle S. & Con. Co	.....	5,000	.....	....	1888	Removed after one year.
11	1887	1	Fort Wayne, Ind.	Vivartas	390,922	.....	.....	....	1896	Followed by Dixon Crematory.
12	1887	1	E. 17th St., N.Y.C.	Vivartas	.....	.....	.....	....	1889	Experimental.
13	1888	1	Chicago, Ill.	Wm. Mann	.....	11,000	....	150	1889	Experimental
14	1888	1	Detroit, Mich.	A. L. Patrick	413,832	.....	.....	....	1888	Experimental. Beehive pattern.
15	1888	1	Coney Island, N.Y.	Engle S. & Con. Co	.....	4,000	50	....	1891	Replaced by Engle, No. 33.
16	1889	1	Jacksonville, Fla.	Engle S. & Con. Co	.....	4,500	50	....	1890	Replaced by Engle, No. 23.
17	1889	2	Findlay, O.	Engle S. & Con. Co	.....	.....	.....	....	1896	Double fur.; one for nightsoil.
18	1889	2	Birmingham, Ala.	Engle S. & Con. Co	.....	4,000	....	20	1895	Double fur.; one for nightsoil.
19	1889	1	Brunswick, Ga.	Engle S. & Con. Co	.....	4,500	50	....	1890	Replaced by Engle, No. 24.
20	1889	1	N. Y. C. Dis'f'g Sta.	Engle S. & Con. Co	.....	2,500	....	5	.....	In continuous use since instal'n.
21	1889	1	Newport, R. I.	Bliss Patent	.....	.....	.....	....	1890	Not accepted by city; removed.
22	1889	1	Savannah, Ga.	Hughes & Hoskins	391,614	.....	.....	....	1889	Experimental; fuel, oil.
23	1890	1	Jacksonville, Fla.	Engle S. & Con. Co	.....	4,000	75	....	1897	To replace No. 16; fol'd by Dix'n
24	1890	1	Brunswick, Ga.	Engle S. & Con. Co.	.....	.....	.....	....	1897	To replace No. 19.
25	1890	1	St. Augustine, Fla.	Engle S. & Con. Co	.....	3,500	75	....	1894	Built for contractor.
26	1890	1	Tampa, Fla.	Engle S. & Con. Co	.....	.....	.....	....	1895	For nightsoil.
27	1890	1	Allegheny, Pa.	W. Swindell	546,438	.....	.....	.....	.....	In market house; still in use.
28	1890	1	Butte, Mont.	Engle S. & Con. Co	.....	.....	.....	.....	.....	Reported in use 1906.
29	1890	1	Panama	Engle S. & Con. Co	.....	.....	75	....	.....	Still in use.
30	1891	2	Savannah, Ga.	Engle S. & Con. Co	.....	14,000	100	....	1903	Double furnace; one for n'tsoil.
31	1891	1	Des Moines, Ia.	Engle S. & Con. Co	.....	.....	....	25	1903	To replace No. 6.
32	1891	1	Chicago, Ill.	B. C. Heavey	411,903	.....	....	20	1902	Experimental; fuel, petroleum.
33	1891	1	Coney Island, N. Y.	Engle S. & Con. Co	.....	4,000	50	....	1896	To replace No. 15.
34	1891	2	Toronto, Canada	Coatsworth	.....	.....	100	....	1893	Built by day labor by city emp's.
35	1891	1	Buffalo, N. Y.	Jas. Bolan	.....	.....	.....	....	1892	Experimental.
36	1892	1	Richmond, Va.	Engle S. & Con. Co	468,851	7,500	....	20	.....	Fur. enl'ged 1901; now in use.
37	1892	1	Norfolk, Va.	Engle S. & Con. Co	468,852	7,500	....	20	.....	Furnace relined once; op'g 1906.
38	1892	1	Muncie, Ind.	Smith-Siemens	546,497	5,000	.....	....	1905	Fuel, nat'l gas; fol'd by Decarie.
39	1892	1	Corsicana, Tex.	A. Brownlee	448,115	.....	....	50	.....	No reports.
40	1892	1	Gainesville, Tex.	A. Brownlee	.....	.....	.....	.....	.....	No reports.
41	1892	1	Lowell, Mass.	Engle S. & Con. Co	.....	7,500	....	20	1905	Operated only in summer.
42	1893	2	World's Fair, Ch'go	Engle S. & Con. Co	.....	.....	....	100	1893	Fuel, oil; awarded Grand Prize.
43	1893	1	Boston, Mass.	S. G. Brown	537,801	.....	.....	....	1894	Experimental; fuel, oil.
44	1893	1	Indianapolis, Ind.	Bulfinger	.....	.....	.....	....	1894	Fol'd by Weislogel Red'n Proc's.
45	1893	1	Philadelphia, Pa.	N. Dowling	533,448	.....	.....	....	1894	Experimental; fuel, oil.
46	1893	1	Philadelphia, Pa.	Vivartas	.....	.....	.....	....	1895	Followed by Smith-Siemens.
47	1893	1	Terre Haute, Ind.	A. Brownlee	537,339	9,000	75	....	.....	No reports; believed to be op'ng.
48	1893	1	Elwood, Ind.	Dixon Crematory Co.	461,327	.....	.....	....	1901	Fuel, nat'l gas; dry rubbish only.
49	1893	2	Toronto, Canada	Jones	.....	15,000	.....	.....	.....	Operating 1906.
50	1893	1	Yonkers, N. Y.	J. McKay	530,623	5,000	....	25	.....	Operating 1906.
51	1893	1	Wilmington, Del.	S. G. Brown	501,181	.....	.....	....	1897	First water-jacketed furnace. Followed by Dixon.
52	1893	1	Chicago, Ill.	J. C. Anderson	520,283	60,000	500	....	1893	Experimental; fuel, oil.
53	1894	1	Salt Lake C'y, Utah	Engle S. & Con. Co	.....	12,000	.....	....	1902	Des'y'd by fire; fol'd by Dixon.
54	1894	1	Ogden, Utah	Engle S. & Con. Co	.....	.....	.....	.....	.....	No reports; believed to be op'ng.
55	1894	2	Atlanta, Ga.	Dixon Crematory Co.	517,816	12,190	....	50	1903	Followed by Lester furnace.
56	1894	2	Camden, N. J.	Dixon Crematory Co.	583,663	9,900	.....	.....	.....	Double furnace; now operating.
57	1894	10	Atlantic City, N. J.	Smith-Siemens	546,497	65,000	....	150	1899	Fuel producer gas; followed by Arnold Process.
57½	1894	8	Philadelphia, Pa.	Smith-Siemens	.....	.....	.....	....	1899	Fuel, producer gas.
58	1894	1	Montreal, Canada	Chs. Thackeray	553,574	50,000	....	150	.....	Operating 1906.
59	1894	1	Troy, N. Y.	Dixon Crematory Co.	.....	.....	.....	....	1905	Destroyed by fire 1906.
60	1895	2	McKeesport, Pa.	Dixon Crematory Co.	.....	.....	....	20	1904	Removed expiration lease of ground. Followed by Pearson.

	Date of Con-s'tion	No. of Fur-n'ces	Location	Type of Furnace or Name of Builder	No. of Patent	Contract Price or Cost	Capacity in 24 Hours Yds.	Capacity in 24 Hours T'ns	Date of Dis-con-tin'ce	Remarks
61	1895	1	Scranton, Pa.	Vivartas			125			No reports; believed to be op'ng.
62	1895	1	New York City	Colwell	583,566				1896	Experimental; dry refuse only.
63	1895	1	Flatbush, N. Y.	Burns					1896	Experimental.
64	1895	1	Charlotte, N. C.	Dixon Crematory Co.						Operating.
65	1895	1	Anderson, Ind.	Local Design						For dry refuse only; no reports.
66	1895	1	Trenton, N. J.	Dixon Crematory Co.					1901	Followed by Davis Co.
67	1895	1	San Antonio, Tex.	Brownlee						No reports.
68	1895	1	New Br'ton, N. Y.	Brownlee		6,500			1898	Followed by Dixon Crematory.
69	1895	1	Evansville, Ind.	Engle S. & Con. Co						Operating.
70	1895	1	San Salvador, S. S.	B. Boulger	537,181			25		No reports.
71	1895	1	Lafayette, Ind.	A. Brownlee					1899	Followed by Dixon Crematory.
72	1896	1	Los Angeles, Cal.	Dixon Crematory Co.				50	1905	Followed by Decarie Incinerator.
73	1896	1	Syracuse, N. Y.	J. S. McGiehan	554,453				1897	Experimental; followed by Holthaus Process.
74	1896	1	York, Pa.	Dixon Crematory Co.				25	1904	Not operating.
75	1896	1	Fort Wayne, Ind.	Dixon Crematory Co.				40		Operating. Add'l fur'ce in 1900.
76	1896	1	Washington, D. C.	S. G. Brown						Now used for rubbish only.
77	1896	2	Dayton, O.	Dixon Crematory Co.		33,000			1898	Des'yed by fire; not rebuilt.
78	1897	4	Jacksonville, Fla.	Dixon Crematory Co.				80		Operating 1906.
79	1897	2	Wilmington, Del.	Dixon Crematory Co.		16,000				Operated by private co., 1906.
80	1897	32	San Francisco, Cal.	Thackeray Co.	644,980	75,000		600		Partially destroyed by earthquake, April, 1906.
81	1898	1	New York City	Colwell					1900	Waring's Utilization Plant for Dry Refuse.
82	1898	1	San Diego, Cal.	Dixon Crematory Co.				40	1905	Not operating.
83	1898	1	Wichita, Kan.	A. Engle & Co	508,511					Not operating; no reports.
84	1898	1	Topeka, Kan.	A. Engle & Co						No reports.
85	1898	2	Memphis, Tenn.	Dixon Crematory Co.		14,000		40		Two sep. 20-ton fur'ces; op'ing.
86	1898	1	Youngstown, O.	Dixon Crematory Co.				40		Operating 1906.
87	1898	1	Washington, D. C.	Smith-Siemens					1898	Never put into commission.
88	1898	1	New Orleans, La.	Dixon Crematory Co.					1902	Experimental.
89	1899	1	Dallas, Tex.	Garretson & Taintor	503,845					No reports; fol'ed by Dixon Co.
90	1899	1	Portland, Ore.	Engle & Thompson		16,000				Replaced by same builders 1901.
91	1899	1	Houston, Tex.	N. Risley	674,319	8,000				No reports.
92	1899	1	Westmount, Can.	Decarie Co	596,421			20	1900	First municipal Decarie plant.
93	1899	1	Trenton, N. J.	Davis Co	462,035	24,000		53		Operating 1906; add'l cell & st'ck
94	1899	1	Boston, Mass.	Morse-Boulger		30,000	500			For dry refuse only; op'ng 1906.
95	1899	2	Havana, Cuba	Davis Co	462,035			100	1903	Waste towed to sea.
96	1899	1	Lafayette, Ind.	Dixon Crematory Co.				25		Operating 1906.
97	1899	2	Memphis, Tenn.	Dixon Crematory Co.		5,400		10		Second installation; operating.
98	1899	1	Greenville, Miss.	Dixon Crematory Co.				10	1902	
99	1899	1	Long Is. City, N. Y.	Dixon Crematory Co.		9,940		15		Operating 1906.
100	1899	1	New Br'hton, N. Y.	Dixon Crematory Co.		9,940		15		Operating 1906.
101	1899	1	Flushing, N. Y.	Dixon Crematory Co.		9,940		15	1905	Followed by Pierce-LaChapelle.
102	1899	1	Far R'k'way, N. Y.	Dixon Crematory Co.		9,940		15	1905	Followed by Pierce-LaChapelle.
103	1899	1	Jamaica, N. Y.	Dixon Crematory Co.		9,940		15	1905	
104	1899	1	Bridgeport, Conn.	Dixon Crematory Co.		12,000		30	1904	Suspended; reduction company operating contract.
105	1899	1	Plainfield, N. J.	Vivartas					1900	Built for private company.
106	1900	1	Lancaster, Pa.	Davis Co	462,035	15,350		50		Operating 1906.
107	1900	1	Fort Wayne, Ind.	Dixon Crematory Co.				20		Second installation.
108	1900	1	Atlanta, Ga.	F. F. Lester	658,658				1902	Followed by Decarie 1904.
109	1900	2	Grand Rap's, Mich.	Engle S. & Con. Co	699,635	14,780		50		Operating 1906; Robinson Pat.
110	1900	2	Louisville, Ky.	Dixon Crematory Co.		43,960		100	1901	Not op'ng; contract not comp'te.
111	1900	1	Joliet, Ill.	Dixon Crematory Co.	667,445	8,000		30		Operating 1906.
112	1900	1	Ottawa, Ill.	LaChapelle & Pearce	577,184					No reports; believed to be op'ng.
113	1900	1	Evanston, Ill.	LaChapelle & Pearce					1903	
114	1900	1	Covington, Ky.	Dixon Crematory Co.		4,650		20		Operating.
115	1901	1	Waterbury, Conn.	H. B. Smith	757,149					Operating; enl'ged or reb'lt 1906
116	1901	4	Milwaukee, Wis.	Engle S. & Con. Co	699,635			200		Operating 1906; Robinson Pat.
117	1901	1	Oil City, Pa.	Davis Co		4,000				Operating 1906.
118	1901	1	Toledo, O.	J. Smead	607,553				1902	Experimental.
119	1901	1	Chicago, Ill.	W. B. Wright	575,088	14,000		30		Operating; second installation.
120	1901	2	Minneapolis, Minn.	Decarie Co						Replaced by larger cons'ion 1906
121	1901	1	Vancouver, B. C.	A. Engle		16,000				Supposed to be operating.
122	1902	1	Mansfield, O.	Dixon Crematory Co.				15		Op'ing with sewage disp'l plant.
123	1902	1	Allentown, Pa.	Dixon Crematory Co.		15,735		20		Operating 1906.
124	1902	1	Wilmerding, Pa.	Dixon Crematory Co.				15	1902	
125	1902	1	Hamilton, O.	Dixon Crematory Co.		11,270		40	1905	
126	1902	2	Newcastle, Pa.	Dixon Crematory Co.				30		Operating.
127	1902	1	Manila, P. I.	Morse-Boulger Co		50,000		140		Operating.
128	1902	1	Newport News, Va.	H. B. Smith					1902	Not accepted by city.
129	1902	1	Dallas, Tex.	Dixon Crematory Co.		8,500		25		Operating 1906.
130	1902	1	St. Catalina Is., Cal.	Dixon Crematory Co.				15		Operating.
131	1902	1	Johnstown, Pa.	Decarie Co				15		Built for private company.
132	1902	4	Winnipeg, Man.	Local Design		14,000				To be followed by Decarie Co.
133	1902	1	Long Branch, N. J.	Municipal Eng. Co.	766,848					Operating 1906.
134	1902	1	Salt Lake City, U'h	Dixon Crematory Co.		13,224		25		Operating.
135	1902	1	Clarksburg, W. Va.	Dixon Crematory Co.		4,000		10		Operating.
136	1902	2	Canton, O.	Dixon Crematory Co.		19,985		40		Operating.
137	1902	1	W. 47th St., N.Y.C.	H. de B. Parsons		15,300			1906	For dry refuse only; replaced by second incinerator.
138	1903	2	Homestead, Pa.	Dixon Crematory Co.		8,500		30		Operating.

	Date of Con-s'tion	No. of Fur-n'ces	Location	Type of Furnace or Name of Builder	No. of Patent	Contract Price or Cost	Capacity in 24 Hours Yds.	Capacity in 24 Hours T'ns	Date of Dis-con-tin'ce	Remarks
139	1903	1	South Bend, Ind.	Dixon Crematory Co.	724,898	6,885	....	25	.....	Operating.
140	1903	1	B. of Bronx, N.Y.C.	Decarie Co.	.....	.....	....	....	1903	
141	1903	2	Oakland, Cal.	Dixon Crematory Co.	.....	.....	....	50	.....	Operating.
142	1903	1	Coudersport, Pa.	Davis Co.	.....	.....	....	....	.....	Operating.
143	1903	1	Spokane, Wash.	Decarie Co.	.....	21,000	....	40	.....	Operating.
144	1903	1	Meadville, Pa.	Dixon Crematory Co.	.....	9,000	....	25	.....	Operating.
145	1903	1	Tampa, Fla.	Decarie Co.	.....	15,700	....	25	1905	Followed by Dixon.
146	1904	1	Charleroi, Pa.	Dixon Crematory Co.	.....	.....	....	15	.....	Operating.
147	1904	1	Char'stown, W. Va.	Pearson Incinerator	.....	8,077	....	....	.....	No reports; believed to be op'ng.
148	1904	2	World's Fair, St. L.	Dixon Crematory Co.	.....	.....	....	60	1904	Awarded Grand Prize.
149	1904	1	Buffalo, N. Y.	Morse-Boulger Co.	.....	40,000	500	....	.....	Operating; Utilization plant for dry refuse.
150	1904	2	Atlanta, Ga.	Decarie Co.	.....	31,500	....	200	.....	Operating.
151	1904	1	McKeesport, Pa.	G. H. Pearson	.....	12,077	....	50	.....	No reports.
152	1905	1	Muncie, Ind.	Decarie Co.	749,933	17,869	....	40	.....	Operating 1906.
153	1905	1	Boro Manh'n, N.Y.,	H. de B. Parsons	.....	34,193	500	....	....	For dry refuse only.
	1905	1	at Wm'gh Br, N. Y.	F. P. Stearns	772,681	.....	500	....	....	Power used for electric lighting.
154	1905	1	Los Angeles, Cal.	Decarie Co.	.....	70,864	....	200	.....	Operating 1906.
155	1905	2	Brooklyn, N. Y.	Amer. R. T. Co.	.....	.....	800	....	.....	For dry refuse only; power used by B. R. T. R. Co.
156	1905	1	Brooklyn, N. Y.	Decarie Co.	.....	.....	300	....	.....	For dry refuse only.
157	1905	1	Marion, O.	G. H. Pearson	.....	.....	....	....	.....	Fuel, natural gas; for garbage and nightsoil.
158	1905	1	Lowell, Mass.	Decarie Co.	.....	10,000	200	....	.....	For dry refuse only.
159	1905	1	Flushing, N. Y.	Pearce-LaChapelle	.....	24,900	....	25	.....	
160	1905	1	Butler, Pa.	Morse-Boulger Co.	.....	5,700	....	25	.....	
161	1905	1	Duluth, Minn.	Decarie Co.	.....	29,000	....	80	.....	
162	1905	1	Sacramento, Cal.	Dundon Incinerator	.....	14,600	....	....	1906	Not accepted by city.
163	1905	1	Wabash, Ind.	Dixon Crematory Co.	789,329	.....	....	10	.....	
164	1905	2	Guayaquil, Ecd.	Dixon Crematory Co.	.....	.....	....	40	.....	
165	1906	1	Shreveport, La.	Dixon Crematory Co.	.....	9,970	....	25	.....	Fuel, nat'l gas; mixed waste.
166	1906	1	Elmira, N. Y.	Pearson Incinerator	.....	16,277	....	....	.....	Built for private co.; not comp'd
167	1906	1	Steubenville, O.	Lewis & Kitchen	.....	.....	....	....	.....	No reports; nearing completion.
168	1906	1	Rockaway, N. Y.	Pearce-LaChapelle	.....	24,975	....	20	.....	
169	1906	1	Westmount, Can.	Meldrum Co.	.....	14,000	....	50	.....	Power used for municipal electric lighting; cost not including building or stack
170	1906	1	Greensburgh, Pa.	Dixon Crematory Co.	.....	.....	....	15	.....	Operating.
171	1906	1	Ocean Park, Cal.	Decarie Co.	.....	7,500	....	10	.....	Not including house.
172	1906	1	Santa Monica, Cal.	Decarie Co.	.....	7,500	....	10	.....	Not including house.
173	1906	1	Sacramento, Cal.	Decarie Co.	.....	25,000	....	40	.....	Under contract.
174	1906	2	Lexington, Ky.	Dixon Crematory Co.	.....	12,000	....	50	.....	Operating.
175	1906	4	Tampa, Fla.	Dixon Crematory Co.	.....	40,000	....	100	.....	Under construction.
176	1906	1	Sewickley, Pa.	Dixon Crematory Co.	.....	.....	....	15	.....	Under construction
177	1906	1	Donora, Pa.	Dixon Crematory Co.	.....	.....	....	15	.....	Under construction
178	1906	1	Jacksonville, Fla.	Weislogel Furnace	803,650	.....	....	....	.....	In connection with reduction process.
179	1906	2	Winnipeg, Man.	Decarie Co.	.....	126,420	....	140	.....	Under contract.
180	1906	1	Vancouver, B. C.	Heenan & Froude	.....	29,000	....	50	.....	Under contract.
181	1906	1	Edmonton, Alberta	Decarie Co.	.....	40,500	....	50	.....	Under contract.
182	1906	1	New York, 47th St.	H. de B. Parsons	.....	.....	....	....	.....	To replace No. 137 for dry refuse; under contract.

The Chronological Table

In compiling this list (Table XXXII) it was the writer's purpose to place on record the complete series, in chronological order of construction, of the municipal garbage cremating furnaces built in the United States and Canada since 1885. The Dominion of Canada is included because of the almost simultaneous beginning of the work in the two countries in 1885, and also for the reason that several of the furnaces in use in the United States originated in Canada. There are also included the furnaces built by American constructors in four foreign countries—Panama (Colombia), San Salvador, Cuba and Equador—as a part of the American constructive work in regular order.

The list is restricted to municipal furnaces—those employed either directly by the towns, or by private contractors in municipal disposal work—and does not comprise the large number of installations for the United States Government, or the still larger number built for public institutions and private establishments. There are two exceptions to this—Nos. 1 and 20—both the first of their respective types. The installations other than municipal will be classified and enumerated at a later date in connection with this series of articles on waste disposal.

The list also includes the crematories built at the two great world's expositions, Chicago, 1893, and St. Louis, 1904, but these were for temporary purposes, and not considered as permanent municipal plants either by the authorities or the builders.

Again, to preserve the chronological order of erection, those plants for the treatment and disposal of dry refuse are included, though all, with two exceptions—New York City and Lowell, Mass.—are owned and operated by private companies. In several cases where "no reports" can be secured, the furnaces are understood to be discontinued, and should be so accounted. In some others where the reports are not conclusive,

they are believed to be operating and noted accordingly.

The Number of Installations.—The whole number of plants reported upon is 182, counting each as a separate installation, whether containing one or more furnaces.

The whole number of separate furnaces capable of being used and operated independently of each other is 233. This includes some five plants of the same type, replaced for reasons of their own by the same builders or designers, and also about ten others now under construction or contracted for, which are yet to pass their final trials for acceptance, but are here classed as operating.

Those noted as experimental are also included. Several of these were large and very costly structures, and as all were intended for municipal service, they should, with justice, be comprised in this list.

The Number of Furnaces or Cells.—This is governed by the plan of construction. In the so-called American plan with one large receiving chamber, they are frequently built in pairs, one on each side of a central stack. The cell construction allows an indefinite number, contiguous to each other, and connected with a common chimney. Hence the increase in the number of separate furnaces over the number of plants or installations.

The Years of Installation and the Builders.—It has been stated that the first municipal furnace for waste disposal was that at Wheeling, W. Va., but this is probably not the case. It appears that the next after Lieut. Reilly's first construction for the United States Government at Governor's Island was that of L. P. Rider at Allegheny, Pa., and following this was the Wm. Mann furnace for night-soil at Montreal, Canada, both of which preceded Wheeling. All were in the same year, and it is only a question of the month of construction of the first four installations. Andrew Engle's first experimental furnace for night-soil was in the same year, but his first garbage municipal furnace at Des Moines, Iowa, came two years later. In the years 1889 to 1894, many crematories were built by the Engle Sanitary and Cremation Company, but not until the plan of the furnace was changed and more durable material used in 1891 did it take the lead.

The last important installation of the Engle Sanitary and Cremation Company, at Milwaukee, Wis., was a departure from the usual form of construction, and was built under the patents taken out by Robert Robinson. In 1892-93-94 many other builders came forward, and shortly after the World's Fair in 1893 several large plants were built; the Anderson and Heavey at Chicago, Ill., the Vivartas and Smith-Siemens at Philadelphia, Pa., the latter at Atlantic City, N. J., and Washington, D. C., and the Thackeray at Montreal. Of these, the Thackeray only has survived, the others being replaced by reduction processes, except Chicago, which is still without any adequate means for waste disposal.

The Dixon Crematory Company, after its change in plan of construction and personnel of its organization in 1894, acquired a firm foothold in the field which has never been relinquished, and has now the longest list of installations to its credit, the greatest number being in towns and cities of the third and fourth class in population.

From 1895 to 1899 six new types of furnaces were brought out, but none of these succeeded in their first attempt, one only surviving for future work after a radical change in its form of construction.

The years 1899 to 1903 were the period of greatest activity, nearly sixty installations being made of twelve different types, seven of which proved unsatisfactory and did not continue. Nearly all the plants erected were of small capacity, two only being of one hundred tons. In this period the first refuse disposal stations were built, as well as the greatest number of installations for the United States Government and for institutions. During the past four years fewer new types have appeared, the builders seeking rather to perfect and strengthen the weak points in their apparatus.

The locations indicated in the table cover the widest possible range of territory, from the northern limit of population to the tropical countries of the South, and the whole width of the continent from the Atlantic to the Pacific oceans.

Patents Issued by the United States Government.—The patents for apparatus to burn wet fuels began with No. 383, reissued August 15, 1856, and this was followed by a long series of inventions to burn bagasse, mill waste, tan bark, stumps, and many forms of combustible refuse. The first patent recorded for cremating garbage was that of H. R. Foote, Stamford, Conn., January 21, 1879, No. 211203. Mr. Foote's claims included nearly all of the ideas that were afterwards made the subject of separate inventions by others, but, as a whole, his scheme was in many ways quite impracticable. The rotary cylinder form of furnace was one of the earliest types, but, like most of the first devices, was too elaborate and complex to come into use. The first inventors tried to do too much, and did not clearly understand the character of the material to be destroyed.

The list of patents issued in this country from 1885 up to date includes over 150 for garbage cremating furnaces alone. Besides these are some 75 others for methods and processes for treating, converting, manipulating, and manufacturing municipal waste matter, and about 25 smaller devices for household use in connection with kitchen stoves, and for disposal of night-soil from isolated dwellings.

These inventors display great ingenuity and skill in their theoretical apparatus, but a lamentable lack of practical knowledge of the complex and conflicting character of the waste to be dealt with. The patents enumerated in the table are the ones that have undergone a practical trial under working conditions, and

of these only a limited number have stood the test of continuously successful service.

The Cost of Construction.—The prices given as the costs for installation are gathered from the published reports when bids are asked for or accepted by the towns. There is no way of determining whether they include a complete installation of building, chimney and furnace, with all driveways, etc., or are only confined to the furnace and chimney. As a rule the towns usually buy a complete plant, but sometimes have separate contracts for buildings, or, if in conjunction with other works, the furnace is only a part of a general contract.

There is no standard for comparison of costs of construction by the rated capacity of the plant that can be assumed to be accurate, nor is there any uniformity in the prices of the same construction by the same builders at different places, where the conditions are similar. It is true the expense is often influenced by difficulties in site, or local cost of freight, material, and labor, but this does not account for the wide variation in many cases which are substantially the same in all important features.

The Operating Cost.—An attempt has been made to ascertain the operating cost for fuel and labor per ton of garbage destroyed at these plants, but this has been given up as impracticable. The reports obtained were conflicting and contradictory, tending only to mislead any seeking accurate detail. For lack of a common standard of measurement, there was no starting point to work from. Until there is some system brought into use for measuring and tabulating returns and reports from operating plants, with the items of quantities, time, fuel, labor, maintenance and capital charges, continued over at least one year's period, there cannot be any definite and serviceable details to record.

Such a record from some of the best municipal disposal stations would be of great service to those communities seeking information for their own use, and would go far to place this work on a better basis, and do much to correct the inaccurate and biased accounts now too frequently in circulation.

The Capacity of Furnaces.— The crematories were at first rated by the cubic yard of material consumed in one day, a day being 12 hours, and the cubic yard used because it could be easily computed by taking the measurement of collection carts. Later it was necessary to provide for continuous services, and the capacity was rated by the tons to be destroyed in 24 hours, and this is now commonly taken as the standard, but unless there is an actual weighing of the waste in cases where accuracy is required, there is usually little reliance to be placed on reported figures of capacity.

The Discontinued Installations.—In this column are contained the years when the plants ceased to be active factors in waste disposal work, and were discontinued, abandoned or replaced by others.

Taking the whole number reported, 182, and deducting those previously noted as not to be counted as municipal garbage destroying stations, there are remaining 148 installations built in American and Canadian towns in the past twenty years. Of this number, about one-half, seventy-five in all, are discontinued permanently. In many cases these are replaced by other furnaces, that are still operating; in several places they were retired in favor of reduction processes, and in a very few instances waste disposal by cremation is abandoned, and the town has reverted to its former methods of tipping, or feeding to swine. The reasons for these repeated failures in this department of municipal work need not here be discussed, but will be briefly reviewed later.

The Explanatory Notes.—These must be very brief in so condensed a table as this, and but little has been recorded in this line. The division and classification of the various types and constructions will be attempted later.

These statistics and details, gathered from personal observation, from official sources, and from scattered papers and publications, extending over many years, are necessarily imperfect and incomplete in many details. The writer will be glad to have such additions and corrections as will make this record more complete.

(To be continued.)

Elastic Roadbed of Tarred Gravel

CONSUL-GENERAL Richard Guenther quotes the correspondence in a Frankfort paper from Zurich, Switzerland, stating that trials were recently made there with an elastic road covering invented by Street Superintendent Aeberli. A section of Hohlstreet was covered with the Aeberli material. Many persons witnessed the trial, among them representatives of the municipal and cantonal authorities, who showed great interest. Two steam rollers were employed to smooth the road covered with the new macadam. Trials with a 6-horse wagon loaded with ten long tons gave a satisfactory result after the macadam had been sufficiently rolled. The macadam is prepared of gravel of a fineness of from 30 to 50 millimeters (millimeter=0.0394 inch) in diameter, and is freed of all earthy matter. This gravel is first heated in a specially constructed machine, and from a revolving drum is subjected to the action of liquid tar, so that each particle of gravel becomes covered with a coating of tar. This tarred gravel is then put up in heaps, covered, and allowed to remain so from eight to ten weeks. It is asserted that during that period fermentation occurs, which causes the tar to penetrate into the pores of the gravel and in this way lessens the formation of dust. In covering the road with this material the most painstaking cleanliness must be observed and dry weather must be awaited. No foreign matter must become mixed with the macadam. In rolling it no water must be used. The cost of preparing this macadam is small, 44 pounds of tar being sufficient for 1 cubic meter (28.38 bushels dry) of gravel; where limestone is used, 55 pounds. The machine is operated by four laborers and furnishes from 10 to 15 cubic meters per day.

REVIEW OF THE PERIODICALS

Abstracts and Synopses of the Most Important Articles Treating of Municipal Topics Which Have Appeared During the Past Month in the Leading United States Periodicals and a Few Others

Reinforced Concrete Paving in Denver

THE Denver City Tramway has recently laid between its tracks a pavement somewhat different from the ordinary. The following description and illustration of it are given by the *Electric Railway Review*. The subgrade consists of a bed of gravel and broken stone which supports the ties and is brought up in the center of the track to the level of the base of the rails. A 5-inch layer of concrete is placed between the ties under each rail and for two feet outside of the rails. This concrete bed supports the street pavement. The toothing blocks placed adjacent to the rails are made of basalt, which is a very hard rock of volcanic origin found at the terminus of one of the company's suburban lines. The rock weighs 188 pounds per cubic foot and includes a large per cent. of aluminum. The larger portion of the paved streets of Denver have an asphalt surface. The space between the rails, however, which is paved and maintained by the Tramway company, has a basalt composite surface with beveled blocks of similar material to those on the outside of the rail. The use of this composite surface reinforced with wire and used as pavement is thought to be unique with this system. The spalls which accumulate in cutting the toothing blocks are crushed so that the largest pieces will pass through a 2-inch ring. Six parts of this

DENVER CITY TRAMWAY—VIEW IN FRONT OF CAR HOUSE, SHOWING REINFORCEMENT IN BASALT COMPOSITE STREET SURFACE

material with three parts of sand and two parts of cement are mixed with ordinary concrete and tamped into the space between the beveled blocks. In this mass of concrete is embedded wire fencing of the "Ellwood" type, in which the wires are so woven as to take the form of connecting triangles, thus affording a good anchorage in the concrete. The concrete is tamped wet with its upper surface at a height sufficient to make a smooth joint with the beveled blocks. After this composite surface has been allowed to set it offers an extremely permanent form of pavement which has not been expensive to build.

The half-tone illustration shows the method of placing the woven wire in such pavement as used in front of a car house. As regards durability it is interesting to note that this type of street surface was placed at a track intersection at one of the street corners of Denver six years ago, and although no wire was used to prevent cracking, the pavement remains firm while the paving blocks near by have been badly worn.

English Septic Tanks and Sprinkling Filters

A RECENT number of *The Surveyor* describes sewage disposal works at Stratford-on-Avon of the above combination, one which has been so favorably considered in this country recently. The dry weather flow is estimated at 250,000 gallons (imperial). After being pumped through a mile of 15-inch cast-iron main, lift 100 feet, the sewage is run through four brick septic tanks, each 102x25 feet, by 6 feet average depth, the total capacity being one and one-half times the dry weather flow. Cross-walls are placed in the tanks 15 feet from the inlet end, so that the heavier solids deposited here can be removed without interfering with the rest of the tank or interrupting the septic action. The wall rises nearly to the water surface and the sewage flows over it as a weir. The sludge from these tanks it is proposed to bury in an area of an acre reserved for this purpose, which will be underdrained, the effluent being treated on land. Eight circular sprinkling filters with a total area of 5,000 square yards are provided, one-half being at a higher level than the others, so that double filtration can be obtained if desired. These filters contain 5 feet of clinker. Revolving distributers of the Cresset type are used. There are, in addition, two acres of filtration area in eight beds; also ten acres of gravelly irrigation land. There are also four contact beds, each 67x50 feet and 3 feet 3 inches deep, filled with clinker.

Algae Deoxidize Water

A REMARKABLE action of algæ was reported by H. B. Baldwin and Geo. C. Whipple to the American Public Health Association as having taken place in a 30-acre lake in a Newark, N. J., park. During two nights and a day of August 120,000 or more fish died in this lake from no apparent cause. Investigation appeared to demonstrate that they had died of suffocation, practically no oxygen being found below a depth of one foot at the

lower end of the lake and three feet at the upper. The deoxidation was believed to be caused by the death of large quantities of algæ, and their decomposition. The reasons for this, as given in the paper referred to, are quoted by the *Engineering Record* of December 8th at some length.

Milk Supplies in Cities

THE Royal Institute of Public Health (England) in 1904 appointed a committee to consider "what steps should be taken with the object of securing a pure supply of milk to the consumer," and the report of this committee, which was made a few weeks ago, is given in full in the *Journal of Preventive Medicine* for December. Data are given showing the impurity of London milk and the effects of its use on the infant death rate. Also that the amount of milk produced in England is not sufficient for the population supplied, and that infants of the poor are probably stinted in this ideal food. The average distance from which milk is brought to London is more than 200 miles, and the maximum is 423, which must have an effect on the use of preservatives. It was believed that both the laws with respect to dairies, and their enforcement, were at fault; and the committee suggested extensive alterations of the former.

The Five-Hundred-Mile City

IN the *World To-day* Frederick W. Coburn's study of the growth of a belt of population that extends along the main highways of travel from Portland, Me., to Washington, D. C., is a convincing presentation of the centrifugal effect of the trolley, the telephone, the automobile, and the express train. The city which he pictures, five hundred miles long by a hundred miles wide, is simply the sum of the extension of many centers of population until they form a continuous belt. His argument would be more forceful, however, if he had been content to present the real condition, a series of long, but not yet connected, links; instead of ignoring such gaps of relatively vacant land as those, for instance, between Springfield and Worcester or Baltimore and Washington.

Playgrounds

JOSEPH LEE'S discussion of Play and Playgrounds, put out in a pamphlet by the American Civic Association, is wholly delightful. It is philosophical, pedagogical, and practical, and yet is charmingly written and illumined throughout with touches of humor. The only phase of its subject which it does not cover is the history of the playground movement, which practically is not of great importance, and for that the pamphlet gives a reference. There is absolutely nothing to wish for in Mr. Lee's discussion of his subject, and no one interested in establishing playgrounds, or in any way connected with one already established, should fail to procure this treatise. It can be obtained from the association or direct from Mr. Lee, by addressing him at 101 Tremont street, Boston. If Mr. Lee has children of his own, they are to be envied. His understanding and sympathy are so complete.

Use of Chicago's Small Parks

THE statistics contained in the latest annual report of the South Park Commissioners of Chicago, to indicate the social service of the small pleasure grounds under their control, are supplemented in the Notes and Comments department of the *Architectural Record* for December by figures for June, July and August, 1906. The significance of these additional figures is that for the first time the record of these parks and playgrounds is carried, as a whole, through the summer months; and the playground attention of the country is on the outcome of this Chicago experiment. The attempt there is the most systematic and costly which has ever been made to perform a comprehensive social service by means of small play spaces in a large city, and when the annual report was prepared none of these parks had been run with every department complete for a period of even six months, and some of them for less than one month. The cost of the fourteen recreation centers comprised in the system has been nearly $7,000,000, and from $25,000 to $30,000 is annually allowed to each one for maintenance. It is enough, perhaps, to say that the use of the clubhouses, gymnasiums, baths, athletic grounds, etc., is adequate to the outlay, and that the summer statistics only emphasize the promise of those printed in the spring.

River Front Improvement for Albany.

A PARAGRAPH in the Notes and Comments department of the *Architectural Record* for December describes a suggested improvement for the river frontage of Albany. It would transform "the pier," or seeming island just below the railroad bridge, into a river plaza, sweeping this clear of its ancient and dilapidated warehouses. State Street, with the Capitol crowning its summit, would be then extended straight and broad to the river and carried over tracks and basin to the pier by a handsome concrete bridge. Plans and specifications were prepared by Walter Melius, City Engineer.

Back to the Land

IT is notable that our index of municipal articles in the December magazines includes three of which the theme is "Back to the Land." This is evidence that the cityward drift, which has long been interesting, has begun to alarm, and that measures to counteract it are receiving serious attention. The burden of each writer's plaint is not that the country is getting drained but that the cities are getting too full. They write and argue in hope to relieve the city, rather than to help the country. Mr. Haggard alone pleads for real rusticity. Mr. Brandenburg would create small industrial centers; and even in *The Craftsman* article, which is much the best of the three, it is proudly stated that lots on the town site of one of the Salvation Army colonies, bought at the rate of $25 an acre, have been sold six or seven years later at a rate of $3,000 an acre—a sufficiently urban progression! But the sum of all the writing and thinking on the subject is that a few people are being led out of the most congested parts of cities to country surroundings. They yet make, however, a tiny rivulet beside the incoming stream.

THE MUNICIPAL INDEX

In Which Are Listed and Classified by Subjects All Articles Treating of Municipal Topics Which Have Appeared During the Past Month in the Periodicals Listed Below

Acetylene Journal, Chicago.
Ainsley's Magazine, New York.
American Architect, New York.
American Architect and Building News, New York.
American Homes and Gardens, New York.
American Magazine, New York.
Appleton's Magazine, New York.
Architects' and Builders' Journal, Baltimore.
Architectural Record, New York.
Architectural Review, Boston.
Architects' and Builders' Magazine, New York.
Arena, Trenton. N. J.
Argosy, New York.
Atlantic Monthly, Boston.
Brick, Chicago.
Broadway Magazine, New York.
Bulletin of Dept. of Labor, Washington.
Bulletin of Univ. of Wisconsin,, Madison, Wis.
Bulletin of Univ. of Kansas, Lawrence, Kan.
California Journal of Technology, Berkeley, Cal.
Canadian Municipal Journal, Montreal.
Cement, New York.
Cement Age, New York.
Century, New York.
Charities, New York
Construction News, New York.
Consular Reports, Washington.
Cosmopolitan, New York.
Country Life in America, New York.
Craftsman, New York.
Electrical Journal, Pittsburg.
Electrical Review, New York.
Electrical Railway Review, Chicago.
Electrical World, New York.
Engineer, Chicago.
Engineering-Contracting, New York.
Engineering and Mining Journal, New York.
Engineering Magazine, New York.
Engineering News, New York.
Engineering Record, New York.
Engineering Society of Western Penn., Pittsburg.
Engineering World, Chicago.
Everybody's, New York.
Far Eastern Review, Manila, P. I.
Financier, New York.
Fire and Water, New York.
Fireman's Herald, New York.
Forum, New York.
Garden Magazine, New York.
Gunther's, New York.
Harper's Monthly, New York.
Harper's Weekly, New York.
House and Garden, Philadelphia.
Independent, New York.
Industrial World, Pittsburg.
Insurance Engineering, New York.
Iron Age, New York.
Journal Associated Eng. Societies, Philadelphia.
Journal Franklin Institute, Philadelphia.
Journal of Gas Lighting, London.
Journal of Sanitary Institute, London.
Journal Western Soc. of Engineers, Chicago.
Journal Worcester Poly. Inst., Worcester, Mass.
Leslie's Weekly, New York.
Lippincott's, Philadelphia.
Local Government Officer, London, Eng.
McClure's, New York.
Metropolitan, New York.
Municipal Engineering, Indianapolis, Ind.
Municipal Journal and Engineer, New York.
Municipal World, Ontario.
Munsey, New York.
Outlook, New York.
Pacific Monthly, Portland, Oregon.
Park and Cemetery, Chicago.
Popular Science Monthly, New York.
Proceedings, Am. Soc. Civil Eng. New York.
Proceedings, Engineers' Club, Philadelphia.
Public Service, Chicago.
Putnam's, New York.
Scientific American, New York.
Scientific American Supplement, New York.
Street Railway Journal, New York.
Reader, Indianapolis.
Review of Reviews, New York.
Scientific American, New York.
Scribner's, New York.
Smith's, New York.
Suburban Life, Boston.
Success, New York.
Technical World, Chicago.
Travel, New York.
Van Norden Magazine, New York.
World To-day, Chicago.
World's Work, New York.

ROADS AND PAVEMENTS

Street Cleaning.—Methods in Cleveland. Describes the organization of a street cleaning force of unusual efficiency under the direction of Gus. H. Hanna. 1¾ pages. Municipal Engineering, December.

Highway Construction.—Fundamental factors in determining best method of. 1¼ pages. By James Owen. Municipal Engineering, December.

Paving.—Reinforced Concrete, in Denver. Describes some special methods of paving in car tracks. Illustrated. ½ column. Electric Railway Review, December.

Reinforced Concrete Paving over excavations in Easton, Pa. Specifications and cost. By John McNeal, Jr. ¾ p. Municipal Journal, December 5.

Tarred Gravel Road built by a new process in Switzerland. 1 p. Daily Consular Report, December 13.

Tarred Roads. Extracts from Consular reports giving results in France and England. ¾ p. Tradesman, December 1.

Brick Paving at Canton, O. Experiences with foundations and fillers. Extracts from paper by F. E. Myers, City Engineer, before Ohio Engineering Society. 2-3 p. Engineering News, December 6.

Brick Pavements. Reason for failure other than poor brick. By E. W. Perry. Illustrated. 5½ pp. Good Roads Magazine, December.

Bitulithic Pavement. General paper on, by J. W. Howard, before American Society Municipal Improvements. 4 pp. Good Roads Magazine, December.

Recent Practice in Street Paving. Abstract of report of committee of American Society Municipal Improvements. 1 p. Municipal Journal, December 5.

Pavement Destruction in New York. Discussion of appointment of commission to devise remedy. Editorial. ½ p. Engineering Record, December 8.

Wide and Narrow Streets.—Their advantages compared. Editorial. ½ p. Engineering Record, December 1.

Town Extensions.—Planning and controlling in Germany, by which wide streets, tree-planted, are almost universal. Paper by T. C. Horsfall, before Association of Municipal and County Engineers, England. 1½ pp. Engineering News, December 20.

SEWERAGE AND SANITATION

Sewage Disposal, Manchester.—The Withington Works, [1]. By Chas. H. Ball, Mgr. Detailed description. 1 page The Local Government Officer, December 8.

Sewage, Land Treatment of. Reports to Royal Commission. [8]. Describes Rugby sewerage farm. By Herbert T. Scoble, P. A. S. I., etc. 3½ pages. The Surveyor, (London), October 19-26. November 2-9-16-23-30.

Intermittent Sewage Filters in Winter. Their maintenance. Experience in several New England plants. 2-3 page. Engineering News, December 13.

Septic Tanks and Sprinkling Filters at Stratford-on-Avon. Brief description of the recent plant. ½ p. Engineering Record, December 22, 1-3 p. Engineering News, December 20.

Septic Tank Explosion at Saratoga, N. Y. Theories to account for it by Profs. Mason and Kinnicutt, and Messrs. Barbour, Gould and Eddy. Synopsis of discussion before New England Water Works Association. 1-3 p. Engineering News, December 20.

Greatest New York's Sewage. The problem of its disposal stated. Editorial. 1½ pp. Engineering News, December 20. Municipal Journal, December 12.

Compulsory Sewage Purification. Editorial, discussing the extent to which State Health boards should act arbitrarily in this matter. ½ p. Engineering Record, December 1.

Sewering Elizabeth, N. J. Sewage diverted from Elizabeth River and pumped into Staten Island Sound. General description. Paper by W. H. Luster, Jr., before American Society Muncipal Improvements. ¾ p. Water and Gas Review, December.

Concrete Sewer Pipe at Toledo, O. Brief description. Illustrated. ¾ page. Municipal Journal, December 5.

Sewage Disposal. A review of recent practice. By R. A. Dibdin. Chapter XII and XIII. Local Government Journal, (London), December 7 and 14.

Sewage Purification, advance in a popular exposition of the subject. 3½ pages. By Alexander Potter, C. E. Paper read before the League of American Municipalities. Municipal Engineering, December.

Sewage Treatment on Land at South Norwood, England. Report to the Royal Commission, by Herbert T. Scoble. Complete description, with analysis of sewage and effiuent. 5 pp. The Surveyor, December 14.

Septic Tanks at Birmingham. De-

scription, with cost. Illustrated. 2 pp. Municipal Journal, December 5.

Sanitary Law.—Some Notes on. By E. H. Blake, F. S. I. 4 pages. The Contract Journal, (London), November 28, December 5 and 12.

Contamination of Streams and Oyster Beds.—Prevention of the Bacterial. [1]. Paper advocates sterilization. 3 pages. By W. Pollard Digby and H. C. H. Shenton. The Surveyor, (London), December 7.

Stream Pollution, Legislation Regarding. Discusses proposed statutes and calls attention to fact that certain amount of pollution is natural. 1 page. Municipal Engineering, December.

Public Health.—Progress in Works of, in Malvern, in Recent Years. A detailed description before the Royal Sanitary Institute of water works, sewerage, sewage disposal and other works. 7 pages, plans. By Osborn Thorpe. The Surveyor (London), December 7.

Municipal Sanitation. Report of Gov. ernor C. E. Magoon in the Report of Isthmian Canal Commission for 1906. Describes work done in the canal zone. Engineering World, December 21.

Milk Supplies.—Municipal control of. Report of committee of Royal Institute of Public Health (England), with recommendations. 22 pp. Supervision of Liverpool's milk supply. Described by Prof. E. W. Hope. 6 pp. Dairy Hygiene. Discussed by Sir Chas. A. Cameron. 5 pp. Journal of Preventive Medicine (London), December.

Shellfish Pollution by Sewage.—Abstracts of report upon the subject by H. W. Clark, chemist, Mass. State Board of Health. 1-3 p. Engineering Record, December 1.

Railways Polluting Water Supplies.—Special reference to Seattle, Wash. Paper describing investigations by John W. Alvord, John R. Freeman and Drs. Abbott and Harrington and the author, Wm. T. Sedgwick. 60 pp. Journal New England Water Works Association, December. Review of same. ½ p. Engineering Record, December 22.

Storm Sewage and Rainfall.—Discussion of paper on their relation by Chas. E. Gregory, before American Society of Civil Engineering. 2-3 p. Engineering Record, December 8.

Sewers in Manhattan Borough.—Some notes concerning. 1 p. Engineering Record, December 15.

WATERWORKS

Description of System.—Cleveland's water supply. Abstract of Mr. Whipple's report. The Surveyor, December 14.

Water Supply of Brockton, Mass. Describes force main, pumping plant, and stand-pipe. By Chas. R. Felton, City Engineer. Illustrated, with discussion. 23 pp. Journal New England Water Works Association, December.

Water Works, The New Orleans. Describes the basis for selection and description of system now being installed. 4 pages, 2 illustrations. By George G. Earl, General Superintendent W. W. & S. Branch Municipal Engineering, December, 1906. 2 2-3 pp. Water and Gas Review, December.

Water Purification by Sulphate of Iron and Caustic Lime.—With discussion. (Concluded). Paper by J. W. Ellms, before Central States Water Works Association. 1¼ pp. Water and Gas Review, December.

Pittsburg Water Filtration Plant. Full description of the construction of this plant, now nearing completion. The largest ever constructed. Illustrated. 15 pp. Engineering Record, December 8, 15, 22, 29.

Sulphate of Copper in Filtration. Paper before the Association of Water Engineers, England, by Adolphe Kemna. Review of American results, with discussion. 4 pp. The Surveyor (London), December 14. Contract Journal (London), December 12.

Mechanical Filtration. History of its development. Abstract of paper by F. B. Leopold before Central States Water Works Association. 1 2-3 pp. Water and Gas Review, December.

Iron in City Water. Result of experiments with iron plates, aeration, and filtration at Reading, Mass. 1½ pp. Engineering Record, December 1.

Concrete Filter Walls at Washington, D. C. Brief description of construction. Illustrated. 1½ pp. Municipal Journal, December 5.

Reinforced Concrete Standpipe at Attleboro, Mass.—Description of method of construction. Abstract from paper before New England Water Works Association. Illustrated. 5 pp. Engineering-Contracting, December 26.

Reinforced Concrete Standpipes. Descriptions of those at Fort Revere, Mass., Milford, O., and Attleboro, Mass. Municipal Journal. 3 pp. Municipal Journal, December 5.

Air-Lift for Deep Wells.—An emergency equipment at Marion, O. General description. Illustrated. 2-3 p. Engineering News, December 13.

Salt Water Intake for New York High Pressure Water System.—Brief description. Illustrated. 2-3 page. Engineering Record, December 15.

Flood Control, and Conservation of Water on the Passaic Water Shed.—Possibility of supplying 200,000,000 gals. daily at low cost. Paper before the New Jersey Sanitary Association, by Morris R. Sherrerd. 1½ pp. Engineering Record, December 1.

London's Drinking Water. Chemical and Bacteriological tests for six months. By A. C. Houston. 8 pp. Journal of Preventive Medicine (London).

STREET LIGHTING AND ELECTRIC POWER

Gas Supply Pressures.—A paper advocating a low pressure gas supply. By T. Ebenezer Pye, F. C. S., Chichester, England. American Gas Light Journal, December 10.

Gas Supply Pressure. Old and new. By Norton H. Humphreys. Deals with high pressure mains with reducers at meters. 1½ page. American Gas Light Journal, December 3.

Gas, Distribution of. A technical report read by Dr. H. B. Harrop, chairman of committee, American Gas Institute. 26 pp. American Gas Light Journal, December 3, 10, 17, 24.

Gas Plant, Personal Experiences with a Municipal. By C. E. Moore, Consulting Engineer for Santa Clara, Cal. Paper read at Fourteenth annual meeting, Pacific Coast Gas Association. 2 pages. American Gas Light Journal, December 3.

Uniform Candle Power. Technical discussion on effect of temperature on candle power. Paper before American Gas Institute by W. H. Gartley. Illustrated. 4 pp. American Gas Light Journal, December 24.

Municipal Gas Plant. Report of committee on operation of, with recommendations to lease. 3 pp. Public Service, December.

Gas Meters. Causes of erroneous registration as discovered in practice. Paper by J. M. Rusby, before American Gas Institute. 3½ pp. Progressive Age, December 1.

Public Lighting in Boston.—A handsomely illustrated description of street effect and commercial lighting. 5 pages. By L. D. Gibbs. The Illuminating Engineer, November.

Public Lighting Plant, Detroit's Municipal. Address by Frederick F. Ingram, before National . Municipal League. Comparison of actual cost under public and private ownership. 2 pp. American Municipalities, December.

Municipal Electric Light Plant at Lakewood, O.—Results of expert inquiry into operation for seven years past. 1 p. Public Service, December.

Electric Meters and Meter Reading.—An attempt to do away with the mysteries which surround the electric meter in the minds of many consumers. By Norman Macbeth. 4 pages. The Illuminating Engineer, November.

Municipal Electric Lighting Plant designed for Newark, N. J. Description and estimated cost of construction and operation. 2 pp. Municipal Journal, December 5.

"Contract Plan."—Operation of street lighting at Springfield, Ill. How it was worked. One point of view. By J. E. Smith. 2½ pp. Public Service, December.

Alternating Currents for Incandescent Lighting.—Discusses filaments, frequency etc., for best results. Synopsis of paper by Dr. Clayton H. Sharp, before American Institute of Electric Engineers. 1 p. Electrical Review, December 8.

FIRE AND POLICE

Fire Automobile, an Auxiliary.—An apparatus introduced by the Combination Ladder Co., New York. 2-3 page. Illustrated. Fire and Water Engineering, December 15.

Motor Steam Fire Engines. Description of engine used in English cities. Illustrated. 1 p. Indian and Eastern Engineer. November.

Fire-proof Construction.—Desirability of, in all cities. Special reference to San Francisco. By F. W. Fitzpatrick. 2 pp. Improvement Bulletin, December 8.

Building Codes. Desirability of requiring fireproof construction. Address by C. G. Smith, before International Association of Fire Engineers. 1½ pp. Building Management, December.

Fire Department, Detroit's.—History and general sketch. Illustrated. 2 pp. Fire and Water Engineering, December 22.

Police Organizations. History and functions. By L. F. Field. 2 pp. Municipal Journal, December 5.

GOVERNMENT AND FINANCE

Municipal Government.—How Oregon secured the Initiative and Referendum and what these have accomplished: "The Referendum at Work," by William Macleod Raines. The World To-day, December, 1906.

The Conditions of Service for a British municipality contrasted with those for an American: "The Vocation of Civic Service" in The Point of View. Scribner's Magazine, December, 1906.

Municipal Ownership.—A test of. Monroe, La., becomes owner of an electric street car line. Electric Railway Review, December.

Uniform Bookkeeping for Michigan Cities.—Text of and brief notes on bill

introduced by Howard C. Beck. 1½ pp American Municipalities, December.

Uniform Reports of Municipal Utilities. Presentation and discussion of standard schedule recommended by American Association of Public Accountants. 5½ pp. Municipal Journal, December 5.

Government by Commission. Legislation to this end asked for by Kansas cities. By Sheffield Cowdrick, ¾ p. Municipal Journal, December 26.

REFUSE COLLECTION AND DISPOSAL

Garbage Disposal in Detroit.—Describes the conditions under which a garbage reduction plant was installed. 1 page. Municipal Engineering, December.

"How New York Disposes of its Garbage and Rubbish": Illustrations of six stages of the process. Leslie's Weekly, December 6, 1906.

Richmond Borough Refuses Disposal Plant. Abstract of specifications for. Illustrated. 1 p. Engineering Record, December 8. Engineering News, December 6. Municipal Journal, December 5.

Operation of Wright, Dixon and Meldrum Destructors. Data covering five others. Illustrated. By W. F. Morse. 4 pp. Municipal Journal, December 5.

Refuse Incinerator.—Test of one in New York, which furnishes power for lighting city bridges. ½ p. Municipal Journal, December 26.

PARKS AND CITY BEAUTY

Municipal Art.—Mural Painting widely used in the current decoration of public buildings: "American History and Mural Painting," by Edward Hale Brush. Review of Reviews, December, 1906.

Proposed Memorial Gateway to Central Park, New York, from Fifth avenue: "The Josephine Shaw Lowell Memorial." Charities, December 8, 1906.

"Sixty New Drinking Fountains for New York City," with photographs of the prize design. The Craftsman, December, 1906.

"The Work for Civic Cleanliness and Beauty in Kalamazoo, Mich." Park and Cemetery, December, 1906.

City Beautiful, Movement and What It Contemplates. Address by Erwin Craighead; advocates establishing city beautiful clubs, with suggestion as to what they can accomplish. 2¼ pp. Tradesman, December 1.

Parks.—"The First County Park System in America" (Essex County, New Jersey), No. VI. of a serial article by Frederick W. Kelsey. House and Garden, December, 1906.

Playgrounds.—Recreation Centers in Chicago Parks, abstract of an address by Graham Romeyn Taylor of Chicago before the City Parks Association of Philadelphia. Published as Department Pamphlet No. 6 by American Civic Association.

"Play and Playgrounds," by Joseph Lee. Published as Department Leaflet No. 11 by American Civic Association.

"The Playground Association of Chicago." Charities, December 8, 1906.

Architecture.—A Review of Construction now in progress in New York: "A New New York," by J. M. Bowles. The World's Work, December, 1906.

A Successful Example of Grouped Buildings: "Soldiers' Home in Tennessee." The Craftsman, December, 1906.

RAPID TRANSIT

Description of the "Australian Streetcar Service," statistics and management of the trolley system in New South Wales, by C. Arthur Williams. The World To-day, December, 1906.

Rapid Transit Co., Improvement of the Brighton Beach Line of Brooklyn. Detailed illustrative description of line doing away with grade crossings. 5 pages. Electric Railway Review, December.

Subway, Ventilation of the Boston. A paper read at the New York meeting (Dec. 1906), of the American Society of Mechanical Engineers. Illustrated. 4 pages. Engineering Review, December.

Interurban Line, The Boston Salem. Detailed illustrated description of a new line. 1 page. Electric Railway Review, December.

Cooling System, Experimental, in New York Subway. Describes method of cooling air by means of water from artesian wells. 3 pages, illustrated. Electric Railway Review.

Railway Company's New Buildings, The City. Detailed illustrated description of the Dayton, Ohio, railway company's shop, office and storage building. 2 pages. Electric Railway Review, December.

Vehicles, Steam as a Motive Power for Public. Paper read before the Institution of Mechanical Engineers. By Thomas Clarkson, member. 2 pages, with plans. The Contract Journal and Specification Record, November 28.

Tramways, The Wemyss and District. 2 pages, illustrated. Popular description of a British interurban railway. The Contract Journal and Specification Record, November 28.

Growth of Electrical Traction Systems.—General review of the progress made and difficulties overcome. 1 p. The Financier, December 3.

Street Railway Valuation. Detailed figures of valuation of Chicago's railways by special commission. 1½ pp. Street Railway Journal, December 22.

MISCELLANEOUS

Public Construction.—"Largest Concrete Bridge"; Statistics of the Connecticut Avenue Bridge in Washington: By Guy E. Mitchell. Technical World Magazine, December, 1906.

Tunnel Work under the Hudson and East Rivers, New York. "The Romance of Tunnel Building," by Arthur B. Reeve. The World's Work, December, 1906.

"The Future Terminal Facilities of New York"; Constructing and Planning new bridges, tunnels and subways in New York: By Charles H. Cochrane. Broadway Magazine, December, 1906.

Underground Telephone Conduits in Detroit. General description. Illustrated. 1 p. Municipal Journal, December 5.

Concrete in Municipal Work. Editorial. 1½ p. Municipal Journal, December 5.

Nuisances.—Appeal to stop Steam Whistles. A letter to the Boston "Herald," together with a copy of the Cleveland ordinance, reprinted in leaflet form by the American Civic Association.

Smoke Abatement. Selected from report of St. Louis Civic League's Smoke Abatement Committee. 1½ pp. American Municipalities, December. Municipal Journal, December 19.

Civic Improvement.—Notes on Current Civic Progress in various cities: Notes and Comments department, Architectural Record, December, 1906.

A Boston headquarters for town improvers: "The Town-Room Idea," by Edward T. Hartman. Suburban Life, December, 1906.

Growth of Cities.—The Growing Continuity of Population, and consequent extension of a metropolitan district, from Portland, Me., through Boston, Springfield, Hartford, New York, Philadelphia, and Baltimore to Washington: "The Five Hundred Mile City," by Frederick W. Coburn. The World To-day, December, 1906.

Reflux from City to Country urged on economic grounds; written from an English point of view: "Back to the Land," by H. Rider Haggard. The World To-day, December, 1906.

The Congestion of Population in cities and a plea for the removal of factories: "To Make Our Cities Smaller," by Broughton Brandenburg. Van Norden Magazine, December, 1906.

Salvation Army Colonies and vacant lot farming inducing countryward drift: "An Undertow to the Land," by Florence Finch Kelly. The Craftsman, December, 1906.

Housing.—"German Model Houses for Workmen. IV., Colony Wildau," by William Mayner. House and Garden, December, 1906.

Descriptions of Cities.—"New Orleans."—An artist's impressions of the city; by Charles Henry White. Harper's Magazine, December, 1906.

Pittsburg. An impressive description of the industrial energy of Pittsburg—"Where nothing is done slowly, outside of municipal activities": "The Romance of Steel and Iron in America—Part IX., Pittsburg," by Herbert N. Carson. Munsey's, December, 1906.

Towns and Cities in Southern Brazil, briefly but graphically described: "The South American Situation. III., Little Germany," by Albert Hale. The Reader, December, 1906.

Brief Notes on various Brazilian cities: "Brazil To-day," by Leâo Velloso. Appleton's, December, 1906.

"Legislative Engineering."—Treats of the objections to permitting councils to decide engineering questions, with especial reference to Philadelphia. By John C. Trautwine, Jr. 12 pp. Journal of the Franklin Institute, December.

Telephone Situation, The, in Chicago.—A statement of the local situation, so far as it is of general interest, from the standpoint of Bell interests. 2 pages. Electrical Review, December 15.

Telephone Situation, The, in Chicago. as to its features in Chicago and Columbus. 3 pp. Public Service, December.

Markets and Abattoirs.—Sanitary Features of. General discussion. Wm. P. Gerhard. Illustrated. 2 pp. American Architect, December 15.

Abattoirs and Public Slaughter Houses. Detailed description of those at South Shields, England. Illustrated. 2 pp. Local Government Officer (London), November 17.

Market Places. Photographs of some in Moscow, Montreal, Paris, Damascus and New York. 5 pp. System, November.

Mortality Statistics.—Specially referring to Cambridge, Mass. Relation to mortality of climatic conditions, age, etc.; study of causes of deaths. Paper by L. M. Hastings, with discussion. 21 pp. Journal New England Water Works Association, December.

Algae Destroy Fish.—Remarkable occurrence in lake of Newark, N. J., park system. Full report and investigation. 1 1-3 p. Engineering Record, December 8.

BOOK REVIEWS

Waterworks Distribution.—A Practical Guide to the Laying Out of Systems of Distributing Mains for the Supply of Water to Cities and Towns. By J. A. McPherson, A.M., Inst. C.E. B. T. Batsford, London. Contains 147 pages of text, 19 diagrams and 103 illustrations However desirable a book this may be for English engineers—and we suppose it represents fairly well the common practice among them—it would be useless for Americans, except as a presentation of English methods and apparatus. For instance, standpipes, as the term is used in this country, are not even referred to; but, on the other hand, elevated tanks are supposed to be used in practically every system, there being generally two or three systems of distribution with distinct pressures. In determining the sizes of mains, fire service is not considered, which seemed remarkable until we found that the fire-hydrant barrel was usually 1½ to 2½ inches in diameter, although "for very large volumes of water, especially for the supply of steam fire engines, 3-inch diameter clear-way sluice-valve hydrants are very suitable." Hydrants are placed often 1,000 to 2,000 feet apart, but in the business district two or three may be placed in one block, all connected to a single dead-end line of 3-inch pipe. We also learn the origin of the term fire-plug, used to designate a fire hydrant in some cities of the United States; in England the fire hydrant in some cases has no valve or nozzle, but an elm-wood plug is driven into the upper end of the barrel, to be knocked out and replaced by a hose-connection pipe with a taper end when it is desired to use it. The mains are given a depth of 2 to 2½ feet—they have been frozen at double that depth in this country. They are made in 9-foot lengths, thus requiring one-third more joints than do our 12-foot pipe, and ordinarily have no lead recess in the inside of the bell. Rubber-lined cotton hose is apparently unknown. Each section of a distribution system has a fixed day, called "district day," occurring not oftener than once a week, in which the pressure is cut off to permit of making service connections and repairs. The United States seems to be largely relied upon for water meters, for which the descriptions given of English makes would seem to furnish excellent reason. The descriptions are clear and full, the illustrations generally good and appropriate, the paper and entire get-up of the book excellent, and the index quite complete. The only exception we could take would be to the four-folded insets, which are always inconvenient for a reference book, only one of which seems necessary in this case. The chapter headings are: General Arrangement of Supply to District of Distribution; Notes Upon System of Distribution; Details of Method of Laying Out Distributing Mains; Pipes and Fittings upon Distributing System; Meters and Measurement of Water, and Regulating and Recording Apparatus.

Reinforced Concrete.—By Buel and Hill. Published by the Engineering News Publishing Co. Second edition, revised and enlarged. Price, $5. Contains 492 pages, 297 illustrations, and numerous diagrams and tables. Part I., on methods of calculation, is by Albert W. Buel, and Parts II. and III., on representative structures and methods of construction, are by Chas. S. Hill. This excellent work, treating of a subject which is of great and growing interest to most engineers, first appeared in 1904. Mr. Buel is a specialist in designing, and engineer-in-charge of structural designing and technical work in the office of Virgil G. Bogue, and Mr. Hill was in 1904 an associate editor of Engineering News, which position he now holds with Engineering-Contracting. The index is unusually complete. The chapter headings are: Economic Use and Properties of Reinforced Concrete; Beams and Theories of Flexure; Columns, Retaining Walls, Dams, Tanks, Conduits and Chimneys; Tests and Designs of Arches; Foundation Construction in Reinforced Concrete; Reinforced Concrete in Building Construction, in Bridge and Culvert Construction; Examples of Conduit Construction; Reinforced Tanks and Reservoir Construction; Retaining Walls, Dams, Chimneys, etc.; Material Employed in the Fabrication of Reinforced Concrete; Methods of Construction in Foundation Work, in Building Work, in Bridge Work, in Conduit Work; Facing and Finishing Exposed Concrete Surfaces. "The general plan adopted has been to include all information required by the average designer for computing ordinary structures, so that reference to other works, although desirable, will be necessary only in exceptional cases." "Chapter II., on Beams, . . . was never satisfactory. In this edition it is corrected and greatly enlarged, but is still far from what, in time, it is hoped to make it." This chapter is, however, probably as satisfactory as any which has yet appeared in any text-book; but practical demonstration of the truth of some one of the various theories of flexure is necessary before a thoroughly acceptable one can be written. The second and third parts contain quite complete descriptions of the use of reinforced concrete in various kinds of structures; although we find no reference to its use for sidewalk or roadway paving, which use has been quite infrequent, however. The selections appear to have been made with judgment, but we could wish to have them accompanied by authoritative comments upon their comparative excellences. As it is, few suggestions are offered toward selecting the type of construction best adapted to any given conditions. Altogether, this work still appeals to us as the standard American text-book upon the subject.

American Civics: a Textbook for High Schools and Academies.—By A. G. Fradenburgh, Ph.D., Hinds, Noble & Eldredge, New York, 1906. The author treats his subject in a general way, applicable to all the States, beginning with the small local government. The origin of rural local government, as we have it, is traced back to the time of the Norman conquest of England. In this country, town government began in New England with the signing of the "compact" on the Mayflower; in the South, notably Virginia, the shire or county government was the dominant local unit. Mentioning the Census Bureau's working theory that a local community of 8,000 is a city, the author goes on to describe the subdivisions of a city government which has been created, by an act of a State Legislature, as a public corporation. As an example of such an act, the charter of the city of New York is briefly presented. Some municipal problems are dealt with, such as the separation of city from State and National politics and the questions of home rule and municipal ownership. Fifty-four pages of the book are occupied in the discussion of local government and the remainder with matters of State and National government. At the end of each chapter is a brief bibliography of principal authorities for the use of advanced students.

Report of the Commissioners of Sewerage of Louisville, Ky. To the Honorable Mayor and Council, for the Year Ending January 31, 1906.—Little new work was undertaken, but an Act was passed by the General Assembly to enable cities of the first class to construct a comprehensive system for the disposition of sewage. The ordinance, approved by Mayor Barth, concerning the issuance of bonds by the City of Louisville in the sum of $4,000,000 for the construction of the system, is included. The bulk of the pamphlet of fifty-eight pages is occupied by the reports of the consulting engineers, J. B. F. Breed, Samuel M. Gray, and Harrison P. Eddy, transmitted through the Commissioners to the Mayor.

WHO'S WHO IN MUNICIPAL WORK

COONEY, Peter A.—Fire Commissioner, New Orleans, La. Born in New Orleans in 1864. At age of ten, owing to death of his father he was obliged to go to work. Was employed successively by the Welster and Dillingham Flour Mill Co., R. G. Dun & Co., L. L. Boyd & Co., Pittsburg Coal Co. Was employed by the Standard Oil Co., but left them to promote the Dixie Oil Co. After the absorption of that company by the trust, he went over to the National Oil Works and Mill Supply Company. Built the works of the New Orleans Refinery and Petroleum Company and has been kept busy fighting the Standard Oil Company. He is now president of the National Oil Works and Mill Supply Company, Ltd. Has just been elected to serve a third term of seven years, as Commissioner on the New Orleans Fire Board.—Address 424 Gravier Street, New Orleans, La.

OSBORNE, J. Hosey.—Born at Saddle River, New Jersey, 1870. Business man and Councilman of Passaic, N. J. Opened a book store in Passaic in 1889; entered the political arena in 1904, when he was elected Councilman from the Third Ward. His first important work was that of securing better car service from the Public Service Corporation. Soon after, he won a fight for an extension of the transfer system. In 1905, after a fourteen months' struggle with the Electrical Department of the same company, he won important concessions in the matter of charges for electric current to the city and to the public. Mr. Osborne has just been elected member of the Council for another term of three years. Passaic has already taken steps to own her own water supply and electric plant, and in these matters, no doubt Mr. Osborne will be heard from.—Residence, Passaic, N. J.

THE WEEK'S CONTRACT NEWS

Relating to Municipal and Public Work—Street Improvements—Paving, Road Making, Cleaning and Sprinkling—Sewerage, Water Supply and Public Lighting—Fire Equipment and Supplies—Buildings, Bridges and Street Railways—Sanitation, Garbage and Waste Disposal—Police, Parks and Miscellaneous—Proposals and Awards

BIDS ASKED FOR

STATE	CITY	RECEIVED UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
Street Improvements				
Ohio	Cincinnati	January 4	Paving Lawrence alley with brick, Betts St. with asphalt; laying curb, drains, etc.	M. J. Keefe, Clk. B. P. S.
Ohio	Steubenville	January 4	Paving Washington St. with Hillside block	T. W. Vance, Clk. Bd. Pub. Serv.
Indiana	Terre Haute	January 5, 11 A.M.	Grade and gravel two roads, 2,509 and 10,490 ft. long in Pierson Township	J. W. Denehie, County Auditor.
New York	Newburgh	January 7, noon	Laying 18,700 sq. yds. vitrified or asphalt block or bitulithic on two streets	Everett Garrison, City Engineer.
New York	Amityville	January 7	Macadamizing, etc., Broadway and Park Ave.	Chas. W. Darling, Village Engineer.
Indiana	Knox	January 7	Gravel road Railroad Twp.; cost, $6,006	L. M. Ransbottom, County Auditor.
Indiana	Spencer	January 8, noon	Constructing gravel road, 2¼ miles long	Owen County Commissioners.
Ohio	Troy	January 8, noon	Paving 35,400 sq. yds. at Public Square	L. A. Ziegenfelder, Clk. B. P. S.
Ontario	Toronto	January 8, noon	Erecting municipal asphalt plant	E. Coatsworth, Mayor.
Indiana	Bedford	January 8, 1 P.M.	Constructing gravel roads	Lawrence County Commissioners.
Indiana	Versailles	January 8, 1 P.M.	Building roads in townships; 4,200 ft. Laughery, cost, $18,085; 3,170 ft. Otter Creek, $6,895; 4,940 ft. Brown, $9,497; 2,527 ft., Washington, $5,600	Nicholas Volz, Co. Auditor.
Indiana	Bloomfield	January 8, 1:30 P.M.	Gravel and macadam roads, Wright Twp.	Wm. A. Deekard, County Auditor.
Indiana	Columbus	January 8	One mile gravel road, Hawcreek Township	Wm. A. Morris, County Auditor.
New York	Brooklyn	January 9, 11 A.M.	Regulating, grading and paving streets	Bird S. Coler, President.
Indiana	Rockville	January 9, 1 P.M.	Grade, drain, g'vel, etc., 2 roads, Penn. Twp.	Henry Grubb, County Auditor.
Indiana	Bloomington	January 9, 2 P.M.	Gravel road, 8,275 ft. long, Van Buren Twp.	S. M. Kerr, County Auditor.
Virginia	Norfolk	January 10, noon	Asphalt or bitulithic paving and granite curb, two streets; also macadam. Colby Ave.	W. T. Brooke, City Engineer.
Ohio	Cleveland Heights	January 15	Grade, lay macadam and sidewalks	W. G. Phare, Fairmount, P. O.
Ohio	Cincinnati	January 16, noon	Paving 4,730 sq. yds. Highland Ave. granite block, at $25,226; 1,910 yds. Trade St., brick, $8,136	C. N. Danenhower, Ch. Engr.
Indiana	Princeton	February 1	Constructing 11 miles macadam gravel road.	Harry R. Embree, Co. Aud.
Pennsylvania	Titusville	February 1	Paving streets; estimated cost, $70,000	H. A. Holstein, City Engineer.
Indiana	Valparaiso	March 8	Laying cement curb and gutter on 3 streets	Robert Ewing, City Clerk.
Water Supply				
Pennsylvania	Philadelphia	January 4, noon	Pumping engine for Lardner's Point Station	John R. Hathaway, Dir. D. P. W.
Pennsylvania	Philadelphia	January 4, noon	Coal handling machinery and pockets, Torresdale pumping station	John R. Hathaway, Dir. D. P. W.
Illinois	Chicago	January 5, 11 A.M.	Furnishing 2,800 tons 4 to 16-inch C-I water pipe, and 130 tons special castings, also for valves and water mains	Wm. L. O'Connell, Com. Pub. Wks.
Ontario	Pembroke	January 5	Steel pipe, connections, specials, valves, etc., 18-in. intake, 7,000 ft. long; well 7½-ft. diameter	J. L. Morris, Engineer.
Ohio	Norwood	January 7, noon	1,000 ¾-in. water meters and connections	L. H. Gebhart, Clk. Bd. Pub. Service.
Missouri	Rolla	January 7	Constructing waterworks system	McRae & Harris, Engineers.
New York	New York	January 8	Flashboard equipment on 1,000 ft. spillway of new Croton dam, complete	Aqueduct Commissioners.
Indian Territory	Coalgate	January 9	Boilers, pumps, C. I. pipe, hydrants, valves and specials for Waterworks	O'Neil Eng. Co., Dallas, Tex.
Indiana	Elkhart	January 10	Waterworks system franchise with city option buying	E. L. Arnold, Pres. Bd. Pub. Wks.
Indiana	Gary	January 15, 11 A.M.	Constructing Waterworks inlet, inc. 6-ft. tunnel in clay, 15,000 ft. long, ½ under bed Lake Michigan; shafts, intakes, etc.	Alvord & Burdick, Hartford Bldg., Chicago, Engineers.
Louisiana	Pineville	January 15, noon	Constructing system of waterworks	D. F. Huddle, Mayor.
Pennsylvania	Meadville	January 15, noon	Triple expansion steam pumps of 2,500,000 gals., and 3,000,000 gals. cap. at pump. s'n.	Harry Ellsworth, Superintendent.
Arizona	Bisbee	January 15, 2 P.M.	Constructing water system	Cleve W. Van Dyke, Manager.
Ohio	Cleveland Heights	January 15	Laying 754 ft. 6-in. cast-iron water pipe	W. G. Phare, Fairmount P. O. Clerk.
Illinois	Kangley	January 22, 4 P.M.	1,840 ft. 4-in. pipe, 1,780 ft. 2-in. pipe, connections, valves, hydrants, etc.	Geo. Clay, Village Clerk.
Colorado	Granite	January 22	Constructing reservoir embankment	George G. Anderson, Denver, Eng'r
Louisiana	New Orleans	January 23, 3 P.M.	3,000 tons, 4 to 42-in. cast-iron pipe and 1,100 tons of specials; also for hauling and laying same	Geo. G. Earl, Gen. Supt. Water Bd.
Nebraska	Mitchell	January 24, 2 P.M.	125,000 lbs. steel bars for reinforcement of concrete, U. S. Reclamation Service	E. A. Hitchcock, Washington, D. C.
Michigan	Muskegon	January 28, noon	6,000,000 gal. and 10,000,000 gal. cap. pumping engine, steam or electric power	William Dixon, Supt. Water Works.
New Jersey	Bloomfield	February 1	Constructing new Waterworks system	Wm. L. Johnson, City Clerk.
Manitoba	Winnipeg	March 1, 2:30 P.M.	Water pipes, specials, manholes, valves, etc.	H. N. Ruttan, City Engineer.
Sewerage				
Ohio	Steubenville	January 4	Building sewer in Washington Street	R. L. Brownlee, Pres. B. P. S.
Manitoba	Winnipeg	January 4	Constructing $72,000 concrete trunk sewer	H. N. Ruttan, City Engineer.
New Mexico	Albuquerque	January 5, 2 PM	38 tons cast-iron water pipe hydrants, tees, crosses, ells, valves, etc., triplex pump, 10-h. p. motor centrifugal pump, 5-h. p. motor, brick, hardware, etc.	Burton B. Custer, Supt. Indian Sch.
California	Oakland	January 7, 11 A.M.	Building two brick sewers, cost, $97,000; three concrete, $165,000, and iron-stone pipe sewer, $11,500; six bids	W. B. Fawcett, Sec'y B. P. W.
South Dakota	Beresford	January 7, 8 P.M.	Laying 1,280 ft. 8 and 6-in. sewer	H. A. Sturgess, City Auditor.
Missouri	Webb City	January 7	Laying 1,999 ft. 8-in. sewer pipe, 170 Ys, etc.	W. E. Smith, City Engineer.
Missouri	Rolla	January 7	Constructing sewers; cost, $10,000	McRae & Harris, Engineers.
New Jersey	Merchantville	January 12, 3 P.M.	Constructing system of sanitary sewers	A. W. MacCallum, Chm. Com.
Arizona	Bisbee	January 15, 2 P.M.	Sewerage system and disposal plant	Cleve W. Van Dyke, Manager.
Iowa	Webster City	January 16	Drainage ditch, Dists. Nos. 23, 30, 24 and 17.	O. A. Craigwick, County Auditor.
Kansas	Wichita	January 21, 5 P.M.	B'ld'g storm water sewer No. 5; cost $319,609	R. N. Dorr, City Clerk.
Arkansas	Van Buren	January 22, noon	Building 17,600 ft. clay pipe sewers	Theo. Hartman, Little Rock, Eng.
Iowa	Cedar Falls	January 22, 7:30 P.M	Building 3,768 ft. 60-, 48- and 42-in. brick, and 36- and 30-in. vitrified pipe sewer	F. X. Miller, Chm. Sewer Com.
South Carolina	Orangeburg	January 23, noon	Constructing system of sewers	Edward Hawes, Jr., City Eng'r.

Sewerage—*Continued*

Ohio	St. Mary's	January 30	Complete sanitary sewer system, 14 miles	Riggs & Shermann, Toledo, Eng'rs.
Missouri	Cape Girardeau	February 4, 8 P.M.	Complete sewer system, Dist. No. 1: 12 miles pipe 8- to 21-in. drain and appurtenances.	Granbery Jackson, Nashville, Tenn.
Iowa	Burlington	March 18	Constructing sewers in certain streets	John F. Winters, City Engineer.

Public Buildings

New York	Syracuse	January 3, 6 P.M.	Erecting high school building	Archimedes Russell, Architect.
New York	Buffalo	January 4, 11 A.M.	Three-story brick addition to Central High School	F. G. Ward, Com'r Pub. Wks.
Ohio	Houston	January 4	Erecting school building	W. T. Games, Clk. Bd. Education.
New York	New York	January 7, 11 A.M.	New school in Brooklyn; also repairs to bldgs.	C. B. J. Snyder, Superintendent.
Rhode Island	Newport	January 7, 3 P.M.	Building extension to U. S. Post Office	J. K. Taylor, Washington, D. C.
New Jersey	Union	January 7, 8 P.M.	Erecting two-story brick fire house	Emil Bautz, Jr., Town Clerk.
Arkansas	Mammoth Spring	January 7	Erecting school building	T. A. Sharp, Sec'y School Board.
Kentucky	Louisville	January 8, 3 P.M.	Erecting Crescent Hill branch library	Thomas & Bohne, Architects.
California	Fresno	January 8	Erecting almshouse on Co. Hosp. grounds	W. O. Miles, Clerk.
Georgia	Atlanta	January 10, 3 P.M.	Foundations for Post Office and Court House.	J. K. Taylor, Washington, D. C.
Wyoming	Cheyenne	January 14, 11:30 A.M.	Constructing buildings, etc. Ft. D. A. Russell.	Capt. V. K. Hart, Q. M.
Texas	Dallas	January 15, 3 P.M.	Extension to Post Office and Court House	J. K. Taylor, Washington, D. C.
Michigan	East Jordan	January 15	Erecting brick school, 30 x 40 ft.	Edmund Wilson, Dir., R.F.D., No. 3.
Minnesota	Fairmont	January 15	Electric light fixtures, etc., new Court House.	Bell & Detweiler, Archs.
Ohio	Mansfield	January 16, 11:30 A.M.	100 tons iron and steel for bldg.; also closets and lavatories for 42 cells	Henry Heer, Jr., M. E., Ohio State Reformatory.
Arizona	Talklai	January 16, 2 P.M.	Building stone mess hall, Rice Station School.	J. S. Perkins, Superintendent.
Ohio	Oberlin	January 28	Erecting Carnegie library for Oberlin College.	Patton & Miller, 140 Dearborn St., Chicago, Ill., Architects.
Indiana	Crawfordsville	January 31	Building extension to U. S. Post Office	J. K. Taylor, Washington, D. C.
Iowa	Leon	February 1	Erecting $75,000 Court House	A. S. Thorp, Clk. Dist. Court.
Virginia	Richmond	February 1	Fire-proof high school building, 180 x 220 ft.; estimated cost, $500,000	Charles W. Bryant, Architect.
Louisiana	New Orleans	February 4, 2 P.M.	Erecting court house 250x290 ft. 4 stories, pile foundations, stone and terra cotta exterior, electric elevator, wiring, heating, etc., steel or reinforced concrete frame and floor construction; estimate, $175,000	Bernard McCloskey, Pres. Com.
North Dakota	University	February 5	Library building State Univer'y, cost, $60,000	J. W. Wilkerson, Sec'y Bd. Trustees.
Ohio	Marion	April 1	Four-story addition to school; cost, $10,000.	Geo. B. Christian, Jr., Clerk. Bd. Ed.

Bridges

Louisiana	La Fayette	January 3	Iron draw-bridge, with 16-ft. roadway	Felix H. Monton.
Illinois	Urbana	January 3	170-ft. span bridge on concrete abutments	Ira O. Baker, Engineer.
Ohio	Cincinnati	January 4, noon	Erecting new bridge, Green Township	W. H. Blair, Pres. Co. Com'rs.
Michigan	Manistee	January 4, 2 P.M.	Repairing 100-ft. span bridge and building 50-ft. span bridge of reinforced concrete	County Surveyor.
Nebraska	York	January 7	Building wooden or steel bridges in county	County Clerk.
Kansas	Girard	January 7	Steel and stone bridge 70-ft. span; also one 36-ft. span	Crawford County Commissioners.
Mississippi	Hattiesburg	January 8	Steel bridge over Big Black Creek	T. E. Batson, Clk. Bd. Sup.
Missouri	Albany	January 8	Building on tube foundation: 160-ft. span, 48-ft. approach; 90-ft. span, 64-ft. approach; 70 ft. span, 36-ft. approach; on I-beam leg foundation: three 40-ft. spans, 64-ft. approach; six 30 I-beams, 64-ft. approach; five 24-ft. I-beams, twelve 20-ft. I-beam, and repair 300-ft. span	W. A. Henton, County Surveyor.
Nebraska	Fremont	January 9, noon	Building bridges Dodge Co., during 1907	C. O. Boe, County Clerk.
Washington	Walla Walla	January 9, 1 P.M.	Steel and wooden bridge over Touchet River	County Commissioners
Iowa	Creston	January 9	Building all Co. bridges required in 1907	W. F. Craig, County Auditor.
Kansas	Wichita	January 12	Pile bridges: 156x230 and 60 ft. long; also 60-ft. steel bridge, all 16 ft. wide	Sedgwick County Commissioners.
Washington	Colfax	January 15	Build bridges at Rosalia, Colton and Sutton	Whitman County Commissioners.
Tennessee	Memphis	January 16, noon	Erecting steel girder bridge at Madison Ave.	James H. Malone, Mayor.
Massachusetts	Cambridge	January 16, noon	Steel highway draw-bridge across canal	L. M. Hastings, City Eng'r.
Pennsylvania	Pittsburg	February 8	Building 3 bascule bridges for Chicago, Indiana & Southern Ry. Co.	W. C. Hotchkiss, Chicago, Ill., Gen. Manager.

Miscellaneous

Kentucky	Carrollton	January 2	Dynamo, engine and new boilers for electric-light plant; estimate, $25,000	R. L. Bartlett, City Engineer.
Ohio	Cleveland	January 3	Building and operating street railways	Peter Witt, City Clerk.
Wisconsin	Green Bay	January 3	Arc lights, 1,200 and 2,000 c. p. for sts. 10 yrs.	Light Committee.
Kansas	Clay Center	January 4	Boilers, engines and electrical machinery	Geo. W. Hanna, Mayor.
Ohio	Lakewood	January 4	Collecting garbage and dead animals	B. M. Cook, Clk. Bd. Health.
New York	West Point	January 5, noon	Constructing electrical subway system	Quartermaster U. S. M. A.
Pennsylvania	Newtown	January 7	Lighting borough streets for 3 or 5 years	Henry Aufflerbach, Chm. Com.
Indiana	Mt. Vernon	January 9, 3 P.M.	Erecting Soldiers' and Sailors' monument	S. G. Howard, County Auditor.
Tennessee	Memphis	January 10, noon	Furnishing 3,000 metal street signs	James H. Malone, Mayor.
Virginia	Salem	January 10, 7:30 P.M.	Sale of street railway franchise	Thomas I. Preston, Mayor.
California	Pasadena	January 10	Equipment for municipal electric-light plant.	Herman Dyer, City Clerk.
Michigan	Detroit	January 10	Furnishing 15,000 bbls. Portland cement	J. J. Haarer, Com'r Pub. Wks.
Pennsylvania	Nanticoke	January 15	Building power house, head and tailrace, etc.	Am. Pipe Mfg. Co., 112 N. Broad Street, Philadelpha.
Virginia	Richmond	February 1, 5 P.M.	Erecting bldgs., machinery, apparatus, pipes, etc., to rehabilitate and enlarge gas works; cost, $325,000 to $350,000	W. P. Knowles, Superintendent.
Arizona	Bisbee	February 4, 2 P.M.	Preparing roadbed and subgrade, 5 miles of electric line for Warren Company	Cleve W. Van Dyke, Manager.
Colorado	Aspen	March 1	Erecting power plant, inc. three 450-kw., 11,000 volt, 3-phase, 60-cycle generators, dir-con. to waterwheels under 500-ft. head.	C. E. Doolittle, Manager.
Mississippi	Natchez	March 7, 4 P.M.	Lighting for 10 years, from March 7 1908	S. B. Stewart Chm. Light Com,

STREET IMPROVEMENTS

San Francisco, Cal.—Bids will be received, January 28, for $486,000 street paving bonds. —Board of Supervisors.

Ontario, Cal.—Bonds, $35,000, have been voted for making street improvements.

East St. Louis, Ill.—Council has passed an ordinance authorizing improving of several streets, at a cost of $34,000.

Elgin, Ill.—The Board of Public Works has directed the City Engineer to prepare specifications for constructing sewers in several streets.

Lincoln, Ill.—Steps are being taken to pave certain portions of 59th street.

Indianapolis, Ind.—The Hoosier Construction Company has been awarded a contract for 6,000 square yards of paving.

Tahlequah, I. T.—Plans are being prepared for building macadam road to Okmulgee, a distance of 80 miles.

Louisville, Ky.—R. Lee Figg has been awarded contract for constructing nine square yards of granitoid sidewalks, at $1.15 a square yard; George W. Goswell four pieces, and Henry Bickel two pieces at the same price; Henry Bickel has contract for grading Grand avenue at 20 cents for excavation and 5 cents for removal of embankment; R. Lee Figg has contract for constructing sewer in Eighth street.

Fitchburg, Mass.—Council has authorized loan of $40,000 for street construction, $9,750 for paving construction, and $8,750 for sidewalk construction.—James H. McMahon, Mayor.

Detroit, Mich.—Council is considering following resolutions: For repaving Maybury, from Buchanan to Myrtle; Twenty-fourth, from Michigan south to the railroad, and from Dix to Baker; Twentieth, from Rose to Baker; Twenty-first, from Fort to River street; for repaving with brick Gratiot avenue, from the Michigan Central Belt Line to Field, and for repaving Mt. Elliott avenue from Jefferson to Gratiot, and for paving Pitcher street, between Greenwood and Brooklyn avenues.

Grand Rapids, Mich.—The Board of Public Works is preparing plans and estimates for grading and paving with brick on a concrete foundation, East Bridge, Carrier, South Ottawa street, and Wellington place, and for grading and graveling Hilton and South Market streets.—Samuel A. Freshney, Secretary and General Manager.

St. Joseph, Mo.—Council is considering ordinances for laying brick sidewalks on Twenty-eighth street, and for making improvements on other thoroughfares.—Wm. E. Spratt, Mayor; Joel E. Gates, City Clerk.

Niagara Falls, N. Y.—The Warren Brothers Company of Boston, Mass., will lay 21,200 square yards of paving.

Troy, N. Y.—Besch and Beebe have contract for laying 1,098 square yards brick on Church street, and 690 yards on Franklin street, at $2.28 per square yard; E. H. McKenna for 724 square yards of brick on Front street, at $2.30; John Flynn, Jr., 1,527 yards on Larch avenue, at $2.59; and T. Henry Dumary & Co., 4,510 yards on Monroe street and 3,377 yards on Jackson street, at $2.19, and for laying vitrified paving block on Hawthorne avenue, at $2.02 per square yard.—Edward R. Cary, City Engineer.

Akron, O.—The paving of Hawthorne avenue has passed its third reading, and bids will be invited in time to commence this improvement in the spring; plans for the improvement of Quarry, Church, Centre and State streets by paving with stone have been prepared and referred to the Street Committee.

Canton, O.—The Commissioners have placed the matter of improving a mile and a half of roadway on the North Industry highway in the hands of the State Highway Commissioner at Columbus; this improvement will cost $12,000, and the contract will be awarded in the spring.—Harry Hill, President of Board.

Cincinnati, O.—Council will act on the request of the City Improvement Association and will pave a number of streets along the canal; the question of establishing a city asphalt repair plant is under consideration.

Cleveland, O.—Council has authorized an issue of $200,000 bonds for street improvements.

Norwalk, O.—Council has taken the initial steps for paving West Main street and Norwood avenue, with brick; curbing and considerable sewering is to be done before the paving is arranged for; Engineer Bradbury of Columbus has submitted plans for the new sewerage system.

Toledo, O.—Council has received a petition from the residents of Hawley street for paving.

Erie, Pa.—An ordinance is before Council, authorizing an issue of $250,000 in bonds for improving streets.

McDonald, Pa.—The citizens have voted $35,000 bonds for paving purposes.

Pittsburg, Pa.—The Allegheny County Commissioners will receive bids for the purpose of $500,000 4 per cent., 30-year road bonds.

Scranton, Pa.—An additional contract for 2,518 square yards of paving has been awarded the Standard Bitulithic Company.

Titusville, Pa.—The city has under consideration, 23,500 yards of pavement on Main street, 4,575 yards on Brook street; bids will be asked for in the spring on asphalt block, wood block, sheet asphalt, and brick; contract let to Charles J. Ward for 1,400 yards brick pavement on Mechanic street, also contract to J. H. Alcorn for a 45-foot bridge approach to be constructed in the spring, of stone, reinforced concrete and steel; about a mile of small diameter sewers will be built.—H. A. Holstein, City Engineer; W. M. Dame, City Clerk.

Spartanburg, S. C.—A contract for 10,886 square yards of paving has been awarded the Atlantic Bitulithic Company.

Chattanooga, Tenn.—Council has passed resolutions to submit to a vote of the people issue of $250,000 for street improvements; $28,242 has been appropriated for paving Russell avenue; Market street will probably also be paved.—Alex. W. Chambliss, Mayor; Robert Hooke, City Engineer.

Sequin, Tex.—The Guadalupe County Board has decided to issue $50,000 additional bonds for improving roads.

SEWERAGE

Argenta, Ark.—Council has voted to expend $75,000 for construction of system of sewers.

San Francisco, Cal.—Bids will be received, January 28, for $1,086,000 sewer bonds.—Board of Supervisors.

San Jose, Cal.—Arrangements are being made to build storm sewers.

Santa Monica, Cal.—The Sewer Board has not secured bids for constructing sewers, for which $24,000 in bonds have been voted.

Bridgeport, Conn.—The Director of Public Works has been authorized to have sewer constructed in Goodwin street; Council is also considering construction of other sewers.—Mayor Reynolds.

St. Augustine, Fla.—An election will be held, January 8, to vote on the question of issuing $100,000 sewer bonds.—E. E. Boyse, Mayor.

Litchfield, Ill.—Council is preparing to issue $70,000 sewer bonds.

Pekin, Ill.—The matter of issuing $112,000 bonds for constructing a sewerage system is under consideration.

Kansas City, Mo.—W. C. Mullins was low bidder for constructing sewers, bids for which were opened December 20, at $41,901.60, as follows: 50, 56 and 62-inch sewer, 1: 2½: 5, at $7.20 per foot; 64, 72, 78, 80 and 84-inch at $8.20, earth and rock excavation, concrete at $9 per yard; bulkhead, $100; concrete reducer, $125; concrete manholes, $50 each; wages of common labor $1.50 to $2 per day; the Parker-Washington Company bid $57,657.73; R. J. and W. M. Boyd, $66,628.95 and Michael Walsh, $60,158.75.—E. A. Harper, City Engineer; W. J. McEllerren, Assistant City Engineer.

Buffalo, N. Y.—W. G. Smith was low bidder for constructing sewer in Humboldt Parkway and Agassiz Place at $8,990, as follows: 542 feet, 18-inch vitrified tile, 13.85 feet excavation, of which 2.55 feet is earth and the remainder rock; 495 feet 15-inch vitrified tile, 12.56 foot trench, of which 2.30 feet is earth and 9.2 feet rock; 635 feet 12-inch vitrified tile, in trench 10.06 feet, 2.57 earth and 7.26 feet rock excavation; wages of common labor, $1.75 per day; Wm. A. Rappich bid $9,460; Wm. Franklin, $9,500; Miller & Franklin, $9,560 and Frederick G. Munion, $13,884.—C. M. Morse, Deputy Engineer, Commissioner.

Akron, O.—The Engineer is preparing plans and estimates for two extensions of city sewers and plans are to be submitted to the State Board of Health. The estimate of cost $42,000; M. H. O'Toole has the contract for constructing a sanitary sewer in Miller Avenue.

Canton, O.—A sanitary sewer is to be constructed in Schwalu street. The engineer reports that the cost of paving Mahoning street is $35,761.

Cincinnati, O.—The Heffron Construction Company was low bidder for constructing sewers in Observatory, Menlo, Mooney, Fisher, Salem and Ritchie avenues, Hyde Park, at $22,673.55; McCarthy Brothers bid $25,695.90; T. P. Strack, $30,959.95; A. J. Henkel, $28,178.90; W. J. Hollander, $28,921,43; T. Maloney, $26,419.65; J. E. Mahoney, $27,643.—C. N. Denenhower, Chief Engineer, Board of Public Service.

Cleveland Heights, O.—J. Nickel was low bidder for laying sewers in Stratford road, at $6,188.70, as follows: 875 feet 36-inch circular sewer 1: 2½: 5, 5-inch shell thickness in 7½ foot trench, clay excavation, at $3.65 per foot; 400 feet 15-inch vitrified pipe sewer in 7½ foot trench, clay excavation, at $1.07; 400 feet 12-inch vitrified pipe, 7½ foot trench, clay excavation, at 95 cents; 1,480 feet 8-inch vitrified pipe sewer, 8½ foot trench, clay excavation, and ground water to be handled, at 80 cents; 124 feet 10-inch vitrified pepe sewer, 7½ foot trench, clay excavation, at 80 cents; manholes, 8-foot depth, $30 each; wages of common labor, $1.75 per day. The Waterworks Construction Company bid $6,226.25; Alex. Tubman, $6,523.81 and J. Winterbottom, $8,148.90; John Nickel was also low bidder for sewer in Fairfax road, at $8,315.50, as follows: 640 feet circular sewer, 1: 2½: 5, 5-inch shell in 8-foot trench, clay excavation, at $3.40 per lineal foot; 930 feet 24-inch vitrified pipe, 7½-foot trench, clay excavation, at $1.60; 580 feet 20-inch vitrified pipe, 7½-foot trench, clay excavation, at $1.30; 340 feet 12-inch vitrified pipe sewer, 7½-foot trench, clay excavation, 95 cents per foot. The Waterworks Construction Company, $8,476.75; Alex. Tubman, $8,740.95 and J. Winterbottom, $10,412.15.—The F. A. Pease Company, Engineers.

Barnesville, O.—An ordinance has passed Council authorizing the construction of a small sewer system, for the accommodation of citizens in the northern part of town.

Bellefontaine, O.—The Board of Public Service wants to sell the gas plant for $150,000, and will apply $100,000 of the proceeds for the construction of a sewer system, if the sale can be effected.

Cleveland, O.—John Wagner and Son are the low bidders for constructing a section of the intersecting sewer from East 20th to East 26th street; the sewer is to be tunneled, and will cost $28,000; the City Clerk has on file for examination plans for sewers in about five or six specified streets.

Columbiana, O.—The proposition to issue bonds for a sewer system will be put to a vote February 12.

Dayton, O.—The Commissioners of Montgomery, Miami and Darke Counties have decided to construct a joint county tile ditch northwest of Philipsburg.

East Liverpool, O.—Estimates for constructing sanitary sewers in half a dozen streets and alleys have been prepared, and call for an outlay of $4,833.

Elyria, O.—Resolutions to construct sewers in part of district No. 2, plans for which have been prepared by the City Engineer, have passed Council.—Frank R. Fauver, Clerk.

Mingo Junction, O.—Plans for a sewerage system have been adopted.—Frank McLester, Village Clerk.

Mt. Vernon, O.—John P. Force, a Columbus Engineer, has made a general report on plans for a sewage disposal plant; he estimates that a plant might cost $5,000 per mile for sewers and $8,000 for beds.

Salem, O.—The Solicitor has presented an ordinance providing for a $28,000 bond issue for constructing the new trunk line sewer; plans for the sewage disposal plant are now in the hands of the City Solicitor.

Warren, O.—A 12-inch sewer is to be constructed along North Vine street; the engineer has prepared plans also for the relief of property owners on Belmont street.

Lebanon, O.—Samuel Monroe & Son, of Portsmouth, were awarded the contract for the South street sewer, at $3,884.44, the work calling for laying 3, 983 feet of 15, 12 and 10-inch vitrified tile sewer in trench of average depth of 9.27 feet, at $9.75 per lineal foot and manholes for $35 each; Theodore W. Hill, of Bellefontaine, bid $4,132.78 and Pflanger & Baxter, of Lebanon, O., $4,324.40.—A. M. Bower, Civil Engineer.

Pittsburg, Pa.—E. K. Morse, Chief Engineer, is preparing plans for rebuilding the down-town sewers.

Chattanooga, Tenn.—Council has passed resolution for $350,000 bonds for sewer purposes, and same will be voted on by people.—Alex. W. Chambliss, Mayor, Robert Hooke, City Engineer.

Seattle, Wash.—Council has passed ordinances for constructing five sewers, to cost $20,150.—R. H. Thomson, City Engineer.

Winnipeg, Man.—The City Engineer is preparing plans for constructing a sanitary sewer in Main street.—C. J. Brown, City Clerk.

WATER SUPPLY

Tuscaloosa, Ala.—The citizens have voted to issue $125,000 5 per cent. 30-year waterworks bonds.—F. G. Blair, Mayor.

Pueblo, Col.—Bids will be received, January 15, at 4 p. m., for sale of duplex condensing crank and fly-wheel pumping engine, complete; capacity 7,500,000 gallons; pump has never been used, being too small; suitable for waterworks or large irrigation projects.—D. E. Burke, Superintendent North Side Waterworks.

Brunswick, Ga.—Council has under consideration issue of bonds for the purchase of the waterworks and electric-light plant.

East St. Louis, Ill.—C. B. Carroll and John Kirkham will construct a waterworks system at a cost of $600,000.

Springfield, Ill.—Council is in favor of establishing a filter plant at the water plant.

Bluffton, Ind.—Council has decided to purchase additional boilers for the waterworks and electric-light station; other improvements will be made.

Wynnewood, I. T.—Bonds of $8,000 have been voted to extend the waterworks.

Emmetsburg, Ia.—Council has decided to purchase a compound duplex pump, with a capacity of 1,000,000 gallons a day, for the city well.

ARTIFICIAL STONE SIDEWALKS, KANSAS CITY MO.

PORTLAND CEMENT SURFACE 1/2 INCH THICKNESS ON 6-INCH CINDERS AND 3 1/2 INCH CONCRETE FOUNDATION

CONTRACT AWARDED TO	Area, Square Feet	Price, Per Square Yard	Amount of Bid
Knapp & Coumbe	750	.16 37/100	$122.77
T. P. Thomson	12,000	.13 34/100	1,650.00
J. E. Welsh	1,900	.14 40/100	275.31
Missouri Sidewalk Co	5,000	.15 20/100	760.00
T. P. Thomson	5,000	.14 75/100	737.50
T. P. Thomson	1,200	.15	180.00
S. J. Armstrong	2,500	.14 4/10	360.00
S. J. Armstrong	5,500	.14 4/10	792.00
Horsman Construction Co	7,000	.14 7/10	1,029.00
Knapp & Coumbe	3,250	.15 97/100	519.02
T. P. Thomson	375	.17 75/100	56.75

West Side, Ia.—The Des Moines Bridge and Iron Company was awarded contract to furnish and lay 960 feet 8-inch pipe, at $1.22; 835 6-inch pipe, $1; 2,670 feet 4-inch pipe, 70 cents and 105 feet 1¼-inch pipe, at 25 cents, all in 5-foot trench; also for elevated tank, 15 feet in diameter, and 25 feet high on 75-foot tower; also for 11 hydrants, 4-inch connection; size of nozzle, 2½ inches, in 5-foot trench. at $28.50 each; also for gate valves; 8-inch, $22; 6-inch, $16; 4-inch, $12; also for duplex pump, 288,000 gallons capacity per 24 hours; head pressure to be pumped against, 150, for $400; other bidders were Walter Tenney, Cook Construction Company, of Des Moines; Chicago Bridge and Iron Company, and Midland Bridge Co., Kansas City, Mo.—F. C. French, Engineer.

Topeka, Kan.—A new 18-inch main will probably be constructed from the up-river pumping station, at a cost of $25,000.

Wichita, Kan.—A Council Committee is negotiating with the waterworks company for the purchase of its system.—R. N. Dorr, City Clerk.

Charleston, Ky.—Council is preparing to establish a water system.

Covington, Ky.—A competent engineer is to be employed to prepare plans and estimates for an auxiliary water main from the reservoirs to the city, and an emergency reservoir of 25,000,000 gallons capacity; the engineer will have necessary repairs made to the machinery at the pumping station.

London, Ky.—The matter of issuing $15,000 waterworks bonds is under consideration.

Murray, Ky.—The question of issuing $20,000 water and light bonds is under consideration.

Boston, Mass.—The Board of Aldermen is considering order authorizing issue of $2,000,000 bonds for the construction of the Westfield Little River water system.

Lawrence, Mass.—The Committee on Waterworks has awarded contract for 1,000 feet of cast-iron pipe to the R. D. Wood Company, at $33.80 per ton.—Councilman Scully.

Springfield, Mass.—Council has authorized issue of $540,000 bonds to begin work on the Little River water supply, on which $2,000,000 will be expended; the area of the Little River water-shed is 47 square miles, while the total area tributary to the present Ludlow water-shed is 20 square yards; it is proposed to construct a distributing reservoir at an elevation which will raise the pressure materially in the resident section.—Hogan & Whipple, New York, Consulting Engineers; Elbert E. Lochridge, Engineer.

Galesburg, Mich.—The city proposes to issue $12,000 in bonds to install municipal water plant.

Muskegon, Mich.—Certain changes to the old water works plant and the purchase of a 6,000,000-gallon high-duty pumping engine have been recommended.—J. H. Blomshield, Consulting Engineer.

Trenton, N. J.—Marcus S. Wrigh, of South River, has been awarded contract for water supply system for the State Sanitarium for Tuberculosis Diseases, at Glen Gardner, for $13,919.

Cincinnati, O.—The Waterworks Commissioners have voted $1,000,000 additional waterworks bonds.

Columbus, O.—Special Engineer John H. Gregory has presented to the Board of Public Service estimates of the cost of making the pipe connections between the new pumping station to the purification plant and the general water main system; it will aggregate a little over a quarter of a million dollars, not including the big conduit to connect the storage dam with the filtration plant, something that Mr. Gregory thinks ought to be started soon, and which will cost several hundred thousand dollars; the more immediate necessities in pipe connections suggested by the engineer are: Duplicate 36-inch mains along Dublin avenue from Sandusky street to the main central city system of mains, to cost $172,557, and an additional 36-inch main from Dublin avenue along Sandusky street to connect with the west side system, and to cost $62,920.

Lima, O.—Council has decided to issue $10,000 bonds for improving water plant.—O. J. Rose, Clerk.

Wooster, O.—The citizens have defeated project to issue $50,000 in bonds for improving waterworks system.

Tarentum, Pa.—Arrangements are being made to expend $50,000 improving the water system.

Brookings, S. D.—Bonds have been voted for the erection of a waterworks plant.

Ft. Pierre, S. D.—Bonds, $9,000, have been voted for improving water plant.

Yankton, S. D.—The city is preparing to issue $100,000 bonds for improving water system.

Seattle, Wash.—Plans and specifications are being prepared for the new extension of the city water system; total cost of improvements will be $2,225,000; Council has passed ordinance to lay water main to cost $7,750.—R. H. Thomson, City Engineer.

LIGHTING AND ELECTRICITY

Ada, Ark.—Council proposes to issue $40,000 bonds for the construction of a light and water plant.

Gunnison, Col.—Council is preparing to expend $50,000 in improving plant of the gas and water company.—Robert B. Lewis, Manager.

Brunswick, Ga.—The matter of issuing bonds for improving of water system is under consideration.

Chicago, Ill.—The Sanitary Board is planning to build additional electric and power plant to furnish 40,000 horsepower.

Lena, Ill.—The Lena Electric Power Company has been incorporated with a capital stock of $12,000, by J. B. Hines, A. J. Clauly and a number of others.

Newcastle, Ind.—Council has authorized an issue of $6,000 in bonds for improving light and water plant.

Noblesville, Ind.—The Noblesville Gas and Improvement Company contemplate the erection of an artificial gas plant to be in operation by the early part of spring.—C. R. Heath, President.

Tulsa, I. T.—The Tulsa Gas Company has been organized with a capital of $100,000, for the purpose of furnishing gas to factories.

Lohrville, Ia.—The question of issuing electric-light bonds will be submitted to the voters, January 7.

Cloversport, Ky.—The Cloversport Light and Ice Company will purchase electric machinery.

Auburn, Me.—One of the electric-light plants of the Lewiston and Auburn Light and Power Company has been destroyed by fire, loss $25,000; it will be rebuilt.

Cambridge, Md.—Congressman-elect William H. Jackson has offered to build an electric light plant at the Cambridge Hospital.

Davidson, Mich.—The issue of $10,000 bonds for a municipal lighting plant is under consideration.

Iron Mountain, Mich.—A. J. Lytle has received franchise to build and equip electric plant for lighting village and vicinity.

Marquette, Mich.—The Electric Light and Power Commission has accepted plans prepared by O'Keefe & Appleton for new power plant which calls for a concrete dam, new power house and open channel for connections.

South Haven, Mich.—At a November election the question of issuing $17,000 in bonds for the purchase of an electric plant was defeated; the city has not yet decided concerning furnishing electric lights for the city.

Stephenson, Mich.—F. T. Guilder, of Menominee, Mich., is preparing to erect an electric plant.

Canon Falls, Minn.—The electric-light plant has been destroyed by fire.

Deep River, Minn.—Council has under consideration the establishment of a municipal lighting plant.

Spirit Lake, Minn.—The electric-light plant is not sufficient to furnish light required for the city.

Warren, O.—The County Commissioners propose to erect an electric-light plant to light the Court House and jail.

Altoona, Pa.—The contract for lighting the city for three years has been awarded to the Edison Electric Illuminating Company at $50 per year, for 400 lamps.

Coopersville, Mich.—The Village Council has closed a contract with the Grand Rapids-Muskegon Water Power Company to light the streets of the village; the contract calls for forty 100-candlepower lamps; the company will also furnish commercial lighting and has already taken orders to supply more than 600 16-candlepower lamps; also to furnish power to a few manufacturing establishments.

El Paso, Tex.—Council has granted a 21-year franchise to a private company to establish an electric-light plant.

Cooper, Tex.—James W. Hockaday is in market for two generators, together with switchboard and equipments; one 100-horsepower engine, and one 100-horsepower boiler; pumps will also be purchased.

Dallas, Tex. — Council will petition the Legislature for authority to issue $200,000 electric bonds and $200,000 market house bonds.

Georgetown, Wash.—The Seattle Electric Company has received franchise to build an electric power plant.

Johnson, Wash. — Arrangements are being made to establish a lighting system for Johnson and Fulton.

Superior, Wis. — The Superior Light and Power Company has increased its capital stock for the purpose of making improvements.

Rapid City, S. D.—The Rapid River Light and Traction Company proposes to build a power plant on Rapid Creek at a cost of $250,000.—Address T. N. Blockhart.

FIRE EQUIPMENT AND SUPPLIES

Coeur D'Alene, Ida.—Council has the matter of establishing a fire alarm system under consideration.

Chicago, Ill.—A committee of residents from Calumet District has petitioned the Council for improved fire protection for the south part of the city.

Peoria, Ill.—The Fire and Police Board recommends the purchase of additional fire steamer.

Louisville, Ky.—The fire chief recommends the erection of an engine house at 17th and South Gate street, and new hook and ladder company to take the place of No. 2 chemical engine at Frankfort avenue; also the purchase of a new engine for engine house at 6th and Hill street and new engine for company No. 15.

Wareham, Mass.—The Town Board proposes to secure additional fire protection.

Flint, Mich.—Arrangements are being made to build an additional fire station.

Fargo, N. D.—The Fire Cheif recommends the purchase of an aeriat truck.

Lansing, Mich.—The Police and Fire Commission is considering the erection of another sub-fire station in the southern part of the city.

Albany, N. Y.—Council has passed resolution to purchase new $1,300 engine for Engine Company No. 6.—Address Alderman Delehanty, Engine Committee.

Hamilton, O.—The Council Committee is considering the advisability of purchasing a fire engine; $5,000 is on hand for the purchase of apparatus.

Lorain, O.—The Board of Public Safety will advertise for bids for the erection of a hose house.

Oklahoma City, Okla.—The Fire Chief recommends the purchase of an additional fire station.

Hyde Park, Pa.—The Good Will Fire Company has purchased a site for a hose house.

Ogontz, Pa.—A fire company has been organized.—Thomas H. Yorke, President.

Bolivar, Tenn.—Council has decided to build a fire house; a volunteer fire company is to be organized.

Benwood, W. Va.—A volunteer fire company has been organized.

PUBLIC BUILDINGS

Fort Smith, Ark.—W. F. May has been awarded contract for new Carnegie library for $27,384, not including heating, furnishing, etc., and laying sidewalks in and around building; the structure will be 60x78 feet.—Architect, Blakeley; Mrs. Tom Boles, Chairman Board of Regents.

Pomona, Cal.—An election will be held to decide the question of issuing $40,000 bonds for City Hall and school building.

Atlanta, Ga.—Council has under consideration issue of bonds for the ercetion of an additional school building.

Collins, Ga.—The citizens have voted issue of $7,500 5 per cent. school bonds.

Lexington, Ky.—The Combs Lumber Company has been awarded contract for constructing the new Normal Building, at the State College; it will be three stories and basement, and cost about $25,000.—H. L. Rowe, Architect.

Fitchburg, Mass.—Council has authorized issue of $44,000 for constructing the Hosmer school building.—James H. McMahon, Mayor.

Flint, Mich.—Preliminary plans will be received until January 7, for the proposed $45,000 City Hall.—D. E. Newcombe, City Clerk.

Northville, Mich.—The question of issuing $10,000 school bonds has been carried.

Houston, Miss.—The citizens of Chickasaw County have voted $40,000 20-year Court House bonds.

Kansas City, Mo.—The School Board has petitioned for an issue of $200,000 bonds for school improvements.

Auburn, N. Y.—The question of issuing $100,000 school bonds will be submitted to a vote of the people at a special election.

Greensboro, N. C.—An election will be held February 19, to decide the question of issuing $30,000 additional school bonds.

Ashtabula, O.—Bids will be received January 8, for the purchase of $40,000 school bonds; interest 4½ per cent.—Chas. E. Peck, Clerk.

Lancaster, O.—An ordinance is being prepared for the issue of $25,000 bonds for the construction of a municipal hospital.

Nelsonville, O.—An election will be held to decide question of issuing $45,000 bonds for erecting school house.

Providence, R. I.—Harding and Hamlyn have been awarded contract to construct new school building in the Eighth Ward, at $18,500; M. F. Murphy has contract for plumbing work in building, at $1,050, and James A. Bates & Co., for electric work, at $595; MacCauley Brothers have contract for plumbing at the Public and Temple streets school, at $4,374; and at the Knight and Tell streets school, at $4,443.

STREET RAILWAYS

Aurora, Ill.—The Aurora Street Railway Company has received franchise to operate an electric road in the village streets.

Crawfordsville, Ind.—The Indianapolis, Crawfordsville and Danville Railway and Electric Company has been incorporated with a capital stock of $400,000, by J. J. Appel, Robert J. Todd and W. F. Nulholland.

New Albany, Ind.—The Louisville, New Albany and Corydon Railway Company, organized to build an electric line from Louisville by way of this city to Corydon, has made surveys reaching the river just below the city, and proposes to build a new bridge over the Ohio River.

Pittsburg, Kan.—The Pittsburg Railway Company is preparing to lay double tracks on certain streets.

Menominee, Mich.—The Menominee Street Railway Company will extend its lines to the Lloyd plant.

Winona, Minn.—E. Boynton is Secretary of a company organized to build an electric line between Winona, Minn., and La Crosse, Wis.

Rome, N. Y.—The Rome and Oneida Electric Company has been incorporated to build an electric road 13 miles in length, with a capital of $350,000.—Michael J. Larkin, of Rome, De Witt C. Hancock, of Oneida, and others, incorporators.

Cincinnati, O.—Arrangements are being made to build a belt line; it has been decided to incorporate the company to be known as the Cincinnati Belt Line Railroad and Terminal Company, with a capital stock of $100,000; the preliminary work is to be done by a committee consisting of Thomas J. Moffett, Chairman, W. A. Bennetts and A. G. Bousman.

East Liverpool, O.—The East Liverpool Traction Light Company proposes to build an electric railway from Sistersville, via Wheeling, W. Va.

Sylvania, O.—The Toledo and Western Railroad Company of Sylvania, has been incorporated with a capital stock of $10,000, by Geo. Cook Ford, F. B. Williams and others.

Chester, S. C.—The Chester Traction Company is being organized with a capital stock of $50,000, to build electric lines.

BRIDGES

Gadsden, Ala.—The Etowah County Commissioners will arrange for the construction of steel approach to the bridge over the Coosa River.

South Windham, Conn.—The Town Board has voted an appropriation of $6,000 to build a steel bridge across the Shetucket River at South Windham.

Jacksonville, Fla.—At the meeting of the Board of Public Works a petition was read requesting that all the bridges across Hogan's Creek between the Washington street bridges be raised two feet.

Columbus, Ga.—The Bridge Committee of Council has recommended the erection of a modern steel bridge across the Chattahoochee River, in place of the present structure at Billingham street.

Newport, Ind.—James F. Pierce, Delphi, Ind., has been awarded contract for substructure of bridge over the Wabash River, which is to have three piers and two abutments of stone and concrete, at $22,518.80; the Lafayette Engineering Company, of Lafayette, bid $29,000 and the Midland Bridge Company, Kansas City, Mo., $34,482.—H. T. Payne, County Auditor.

Tulsa, I. T.—The Frisco Railway Company will build a new bridge over the Arkansas river, the present bridge to be sold either to the county or a private corporation, to be used as a wagon bridge.

Fall River, Mass.—Holbrook, Cabot and Rollins, of Boston, have been awarded contract to build bridge across the Taunton river, at $770,000; the firm bid $420,000 for abutments and piers and $70,000 for approaches; Berlin Construction Company, of Berlin, Conn., bid $230,900 for the superstructure; James F. Keon, of Boston, $450,000 for the abutments and piers; Pennsylvania Steel Company, of Steelton, Pa., $232,000 for building the superstructure; King Bridge Company, of Cleveland, O., $232,000 for the superstructure; Boston Bridge Works, Incorporated, $219,985 for the superstructure; Patrick McGovern, of Boston, $435,000 for piers and abutments; New England Structural Company, of Boston, $217,500 for the superstructure; Eastern Steel Company, of Pottsville, Pa., $263,000 for the superstructure; United Construction Company, of New York, $236,175 for the superstructure; Pennsylvania Bridge Company, of Beaver Falls, Pa., $235,900 for the superstructure; the New Jersey Bridge Company, of New York, $260,788.

Pittsburg, Pa.—Bids will be received for a 186-foot skew span to be erected to carry Ellsworth and two street railway tracks over a hollow of the Pennsylvania Railway.—E. M. Wilkins, Superintendent Bureau of Construction.

Charleston, W. Va.—Bids will be received January 17, for the purchase of $50,000 bridge bonds.—J. A. De Gruytes, Clerk.

Benwood, W. Va.—President Hubbard, of the Wheeling Steel and Iron Works, has formally notified Mayor Joseph Mahood of the mill company's acceptance of the ordinance giving the right to construct and maintain a bridge at Eleventh street.

MISCELLANEOUS

New Haven, Conn.—The citizens are considering the matter of issuing $272,000 improvement bonds.

Washington, D. C.—William Larrabee, of Clermont, Iowa, was the highest bidder for the new Manila, P. I. bonds, bidding 109.1 for $15,000 worth; William A. Reed & Co., bankers of New York City, offered to take the whole or any part of the $2,000,000 worth at 105.77; R. T. Roller, of the Peninsular Savings Bank, of Detroit, Mich., submitted a bid for $30,000 worth at 109. The bonds were awarded to Larrabee and Roner, and the balance to Reed & Co. in the amount and at the prices named.

Bloomington, Ill.—The directors of the Illinois Traction Company propose to rebuild an interurban underground system of heating in this city; they will expend $50,000 in the work.—Address Manager Fisher.

Lowell, Mass.—Council has passed an ordinance authorizing an issue of $71,000 municipal bonds.

Grand Rapids, Mich.—The Garbage Commission has recommended and Council has agreed to the purchase of machinery, including three-ton electric hoist, to cost $400 and swing jib complete with steel trolley, three tons capacity, cost $175; the commission has also recommended purchase of 25 horses for $2,400 and equipment of wagons, sleighs, night soil barrels, racks, shovels, skids, robes, storm covers, etc., from E. S. Keifer for $1,100.—Samuel A. Freshney, Board of Public Works.

St. Paul, Minn.—An ordinance has been passed authorizing an issue of $25,000 bonds for park purposes.

Troy, N. Y.—Over one hundred bids were viewed by the Board of Contract and Supply for street sweeping, and will be acted on by the Commissioner of Public Safety, who will report January 4; bids for removal of garbage, for street sweepers and sprinklers and for operating machines are also being considered.

Philadelphia, Pa.—Bids for cleaning streets for 1907 under the existing system are lower than those under the "great square system." The bids under the old system follow: First district—McNulty & Co., $95,000; E. H. Vare, $80,000. Second—McNulty & Co., $49,900; Vare, $50,000. Third—Peoples Bros., $112,000; Vare, $91,999. Fourth—Peoples, $79,990; Vare, $86,000; Johnson & Co., $71,741. Fifth—James Curran, $116,000; Howard Ruch, $101,700; John Laughlin, $99,474; McNulty & Co.,$101.000. Sixth—James Curran, $48,800; Howard Ruch, $52,000; John Laughlin, $49,848; McNulty & Co., $65,000. Seventh—James Curran, $87,500; Howard Ruch, $115,000. Ninth—David McMahon, $93,900; Peoples Bros., $79,000; McNulty & Co., $76,000; Vare, $94,000. Tenth—Edward Baldi, $84,700; Peoples Bros., $84,000; Johnson & Co., $71,741; McNulty & Co., $84,700. On the "great square" plan the bidders were: David Peoples, who bid on districts Nos. 3, 4, 10, 11; J. H. Terry, district No. 4; E. H. Vare, district No. 3; David McMahon, district No. 9. The bids were as follows: Cleaning asphalt and brick pavements, per 10,000 square feet—Terry, 35 cents; McMahon, .38; Vare, .39; Peoples, .34. Cleaning granite block—Terry, 37 cents; McMahon, .38; Vare, .49; Peoples, 38. Cleaning cobble and rubble pavement—Terry, 40 cents; McMahon, .38; Vare, .49; Peoples, .38. Furnishing block men—Terry, $1.65; McMahon, $1.68; Vare, $1.59; Peoples, $1.80. Flushing carriage ways—Terry, 75 cents; McMahon, $1; Vare, $1; Peoples, 80 cents. Removing ice and snow—Terry, 55 cents; McMahon, .70; Vare, .74; Peoples, .70. Furnishing men with shovels, brooms, etc.—Terry, $1.55; McMahon, $1.60; Vare, $1.64; Peoples, $1.90. Cleaning inlets—Terry, McMahon and Vare, 25 cents; Peoples, .30. Cleaning alleys—Terry, 60 cents; McMahon, $1; Vare, 25 cents; Peoples, .40.

Finland, O.—An ordinance has been passed authorizing an issue of $12,000 bonds for improving Riverside Park.—J. C. Edie, Clerk of Council.

Conway, S. C.—Bids will be received January 22, for the purchase of $40,000 5 per cent. improvement bonds.

THE almost World-wide tendency among the municipalities to go over to the wood-block in preference to the other pavements has been brought about by its record on the London and Paris foundations. We can sell you this foundation at one-half the London and Paris prices. Over twenty-five years ago the creosote wood paving-block fell into utter disrepute in America, on account of the American foundation. **The Nash Road,** Borough of Brooklyn, New York City, U. S. A.

WRITE US TO-DAY for "The Right Man in the Right Place," telling how we find high grade positions for capable men. Offices in 12 cities. Hapgoods, 305 Broadway, New York.

PATENT CLAIMS

836,864.—Adjustable and Collapsible Fire-Hose-Nozzle-Supporting Device. Anson D. Cole, Camden, N. J. Serial No. 309,750.

In a device of the character described, a standard having a head provided with legs, an anchor connected with one of the legs, a frame having a stud rotatably arranged in the head, means for clamping the stud to the head, a shaft rotatably arranged in the free ends of the frame, a clamp having extensions engaging the shaft, said clamp adapted to removably support the nozzle of a fire-hose, a worm-wheel carried by the shaft, a housing forming the extension of the frame and surrounding the worm-wheel and having a worm-shaft engaging the worm-wheel, said worm-wheel adapted when actuated to rotate the worm-gear and when released to prevent rotation of the same, said shaft and clamp.

Proposals

Pumping Engines

Muskegon, Mich., Dec. 11, 1906.

Bids will be received by the Water Committee, up to January 28, 1907, 12 o'clock M., to furnish the city of Muskegon, Mich., with new pumping engines (steam or electric power) of the following capacity: One six million gallon per 24 hours; one ten million gallon per 24 hours. Bids to be made separately on each capacity. Plans and specifications will be on file in the Water Works Office.

PAUL S. MOON,
Chairman, Water Committee.
WILLIAM DIXON,
Superintendent of Waterworks.

Sanitary Sewer System

Merchantville, N. J.

Sealed proposals will be received by the Mayor and Borough Council until 3 P.M., January 12, 1907, for the construction of a system of sanitary sewers. Certified check, $3,000. Plans, proposal forms, etc., at office of borough clerk and at office of City-Wastes Disposal Co., Engr., 156 Fifth avenue, New York City.

A. W. MACCALLUM,
Chairman, Sewerage Committee.

Power House, Head and Tail Race

Nanticoke, Pa.

Proposals will be received by the American Pipe Mfg. Company, 112 North Broad street, Philadelphia, Pa., up to January 15th, 1907, for the construction of a power house, head and tail race, etc., at Nanticoke, Pa. The right is reserved to reject any or all bids or to accept whichever bid that will be to their interest.

STREET LAMP ATTACHMENT
The present flat flame gas light quickly changed to
BEST MODERN LIGHTS.
Lamps giving 10-25 candle power made to produce 40 to 70 candle-power. No additional gas consumed
CENTURY LIGHT & POWER CO.
35 Warren St., N. Y. City

For Machines to Drill, Blast and Test Holes and Water Wells, write "LOOMIS CO., TIFFIN, O."

LEGAL NEWS

A Summary and Notes of Recent Decisions —Rulings of Municipal Interest

Municipal Ownership Legal

Baker vs. **Cartersville.**—Baker filed a bill in the Superior Court seeking to enjoin the Mayor and General Council from municipal ownership and the issuance of $40,000 of bonds for water, gas and electric plant. He maintained that the city had no right to engage in commercial enterprises. The injunction was denied in the lower court and appealed; the lower court is sustained.—Supreme Court, Atlanta, Ga.

City May Issue Bonds

City of Montgomery, Ala., vs. **Essie Reese.**—In a friendly suit to test the law to see whether or not the city had a right under the general or special law to issue refunding bonds, the Supreme Court held the local or special act unconstitutional, but held the city had a right under the general law to issue these bonds. The Council had passed an ordinance to issue $468,000 of these refunding bonds at 4½ per cent. The question whether or not the Council had the authority to do this was brought up and Mrs. Reese in a friendly suit brought the matter before Judge Sayre, who held her contention to be correct, but is reversed by the higher court.—Supreme Court, Montgomery, Ala.

Trunk Sewer Required

Fox vs. **Joliet.**—The Fox property is located near the slough drain. Before the drainage channel was opened the old canal was so much worse than the slough drain that it was not the cause of much complaint. Since the higher sanitary standards have been adopted and the awarding of damages to Fox establishes a precedent. To avoid further claim for damage a trunk line must be built.—Circuit Court, Joliet, Ill.

Penalty Clause Invalid

Harlan and Hollingsworth Company vs. **District of Columbia.**—A fire boat purchased by the District Commissioners was not delivered until 132 days after the time specified in the contract. The sum of $25 per day as liquidated damages, according to the provisions of the contract, and some other charges were deducted from the contract price, and it was claimed that the acceptance of the check by the company was a release of the District from making further payment. The court ordered the Commissioners to pay the company the $3,300 deducted which they had to cover the forfeit.—Circuit Court, Washington, D. C.

No Fees for Mayors

James W. Smallwood, Mayor, vs. **Cambridge.**—Under the municipal code the Mayor of a city where there is no judge and the Mayor performs judicial duties is not entitled to judicial fees collected in cases of violations of city ordinances. Accordingly Mayor Smallwood must refund $1,119.49 to the city.—Supreme Court, Columbus. O.

Taunton Wins Waterworks Case

City of Taunton vs. **City of Middleboro.**—Hon. Marcus Morton, to whom the case was referred as auditor on an appeal from the decision of the Plymouth, Mass., County Commissioners, has just ruled that if the city of Taunton continues to operate its waterworks dam as it has in the past that there seems upon the evidence presented to him to be no claim for damages that have accrued to the town, beyond the possible element of damage which might result in case the Water Commissioners of Taunton, who, under the act, have complete authority over the dam, should let the surplus water down in the daytime, instead of at night. As the water power which is the basis of Middleboro's contention for damages is that supplied to the municipal lighting plant, whose heaviest load is during the night, there might be a small loss if the surplus water was let by the dam in the morning.

NEWS OF THE SOCIETIES

American Economic Association.—Among the papers read before the meeting of the society at Brown University, Providence, R. I., on December 27, was an address by Rear Admiral F. E. Chadwick, of Newport, on "The Newport Charter." The speaker drew a comparison between this charter and recent charters of the so-called "commission type," a subject dealt with at some length in our issue of December 26, page 628. The Newport Charter is a development of the old New England Town Meeting and as such is a return to pure democracy.

National Association of Cement Users.—The headquarters of the convention, Chicago, Ill., January 7-12, will be in the banquet hall of the Auditorium Hotel. The exhibits will be at Tattersall's, corner of Sixteenth and Dearborn streets, where the formal opening will take place at noon on Monday, January 7. The formal opening of the convention will occur at 10 A. M., Tuesday, January 8. Among the subjects dealt with are "Cement Sidewalks," by Albert Moyer. Report of Committee on Streets, Sidewalks, and Floors, George L. Stanley, Chairman. Report on Committee on Testing Cement and Cement Products, E. S. Laisard. "Artistic Uses of Concrete," by A. O. Elzner. "Finish for Concrete Surface," A. O. Elzner. "Concrete as a Plastic Material," H. H. Quinby. Report of Committee on Art and Architecture, Charles D. Watson, Chairman. Report of Committee on Machinery for Cement Users, J. F. Angell, Chairman. Report of Committee on Fireproofing and Insurance, E. T. Cairns, Chairman. Report of Committee on Laws and Ordinances. The officers of the society are Richard L. Humphrey, President, 1001 Harrison Building, Philadelphia, Pa.; Merrill Watson, First Vice-President, 256 Broadway, New York City; Vice-Presidents, John H. Fellows, Mears Building, Scranton, Pa.; O. U. Miracle, Minneapolis, Minn.; A. Monsted, Pabst Building, Milwaukee, Wis., and H. C. Turner, Treasurer, 11 Broadway, New York City.

Calendar of Meetings

December 27-January 2.
American Association for the Advancement of Science.—Annual meeting, New York City.—L. O. Howard, Secretary, Cosmos Club, Washington, D. C.

January 3.
Engineers' Society of Western Pennsylvania.—Annual meeting, Pittsburg, Pa.—F. V. McMullin, Secretary, 410 Pennsylvania avenue, Pittsburg, Pa.

January.
American Institute of Social Service.—Exposition, New York City.—Dr. William H. Tolman, Director, 287 Fourth avenue, New York.

January 7-9.
American Institute of Architects.—Annual convention, Washington, D. C.—Glenn Brown, Secretary, Washington, D. C.

January 8.
Michigan Engineering Society.—Annual convention, Detroit, Mich.—F. Hodgman, Secretary, Climax, Mich.

January 8-11.
National Association of Cement Users.—Annual meeting, Chicago, Ill.—W. W. Curtis, Secretary, 585 Caxton Building, Chicago, Ill.

January 9.
New England Water Works Association.—Annual meeting, Boston, Mass.—Willard Kent, Secretary, Narragansett Pier, R. I.

January 9-11.
Iowa Engineering Society.—Annual convention, Ottumwa, Ia.—A. W. Ford, Secretary, Iowa City, Ia.

January 15.
Wood Preservers' Association.—Annual meeting, Memphis, Tenn.—C. W. Berry, Secretary, Laramie, Wyo.

January 16-17.
American Society of Civil Engineers.—Fifty-fourth annual meeting, at the House of the Society, 220 West 57th street, New York City.—Charles Warren Hunt, Secretary.

January 16-18.
Northwestern Cement Products Association.—Annual convention, St. Paul, Minn.—Martin T. Roche, Secretary, 410 Pioneer Press Building, St. Paul, Minn.

January 17-19.
Indiana Engineering Society.—Annual meeting, Indianapolis.—C. C. Brown, Secretary, Commercial Club Building, Indianapolis.

January 19.
The Engineers' Club of Philadelphia.—Annual meeting, Philadelphia, Pa.—W. L. Webb, Secretary, 1122 Girard street, Philadelphia, Pa.

January 22-24.
American Society of Heating and Ventilating Engineers.—Annual meeting, New York City.—W. M. Mackay, Secretary, P. O. Box 1818, New York City.

January 22-24.
Ohio Engineering Society.—Annual convention, Columbus, Ohio.—E. G. Bradbury, Secretary, 85 North High street, Columbus.

January 23-25.
Illinois Society of Engineers and Surveyors.—Annual meeting, Peoria, Ill.—E. E. R. Tratman, Secretary, 1636 Monadnock Block, Chicago, Ill.

January 24.
Ohio Local Health Authorities.—First annual conference, Columbus, Ohio.

January 29.
Canadian Society of Civil Engineers.—Annual meeting, Montreal.—Prof. C. H. McLeod, Secretary, 877 Dorchester street, Montreal, P. Q.

February 4-16.
National Brick Manufacturers' Association.—National convention, St. Louis, Mo.—Theo. A. Randall, Secretary, Indianapolis, Ind.

February 4-6.
American Ceramic Society.—Ninth annual meeting, Planters Hotel, St. Louis, Mo.—Edward Orton, Secretary, Columbus, Ohio.

February 5-6.
National Association of Paving Brick Manufacturers.—Meeting, Planters Hotel, St. Louis, Mo.—T. A. Randall, Secretary, Indianapolis, Ind.

February 15-16.
Wisconsin Gas Association.—Annual meeting.—Henry H. Hyde, Secretary, Racine, Wis.

February 22.
New England Association of Gas Engineers.—Annual meeting, Boston, Mass.—N. W. Gifford, Secretary, New Bedford, Mass.

February 26.
Association of Ontario Land Surveyors.—Annual meeting, Toronto.—Killaly Gamble, Secretary, 405 Temple Building, Toronto, Ont.

April 18-21.
Southwestern Gas, Electric and Street Railway Association.—Annual meeting, San Antonio, Tex.—Frank C. Duffey, Secretary, Beaumont, Tex.

PERSONALS

Allen, Henry C., formerly City Engineer of Syracuse, N. Y., who has been in charge of the important barge canal for the State Department at Albany, has been again appointed City Engineer of Syracuse, at a salary of $3,500, succeeding Frank J. Schnauber.

Ashdown, J. H., the new Mayor of Winnipeg, Manitoba, recently visited a number of cities to study the question of street cleaning. In Ottawa he learned that until two years ago the sidewalks were cleaned of snow under a contract by ploughs and a charge of two and one-half cents per foot frontage was imposed upon owners of property who got the benefit of the service; now the work is done by day labor and paid for out of the general appropriation.

Coleman, Griffin G., Superintendent of Repairs of Washington, D. C., and formerly Secretary and Manager of the Metropolitan Street Railway Company, of the District of Columbia, died recently in Washington.

Demster, Osborne J., who has had charge of the State road work in Herkimer County, N. Y., has been appointed City Engineer of Little Falls, N. Y., succeeding S. S. Fieter, resigned.

Derr, Dr. Homer M., has been made Professor of Civil Engineering at the Agricultural College, Brookings, S. D.

Douglass, A. C., recently elected Mayor of Niagara Falls, N. Y., has been awarded contract for driving the second Bergen Hill Tunnel of the Delaware, Lackawanna and Western Railroad, and will employ compressed air drills.

Duffy, Michael M., Superintendent of the Fire Alarm Telegram System of Springfield, Ohio, who had been a member of the Fire Department for over twenty-five years, resigned, the same taking effect January 1, and he has been placed on the pension roll at $35 per month by the Trustees of the Firemen's Pension Fund. L. S. Bosley, Assistant Superintendent, is filling the position temporarily, and will take an examination for the place.

Dunbar, W. M., has been elected Mayor of Augusta, Ga., and A. J. Twiggs, Eugene L. Johnson, James T. Bothwell, J. P. Saxon and James C. Platt, Councilmen.

Ellison, William B., Corporation Counsel of New York, has reorganized the Law Department by abolishing the branch divisions for the boroughs of the Bronx, Queens and Richmond. This work will hereafter be conducted from the main office in Manhattan, while the branch office in Brooklyn will be continued. George L. Sterling will be Acting Corporation Counsel in the absence of Mr. Ellison and Theodore Connoly will be in charge of cases on appeal.

Griffin, W. R. W., has been elected President of the Rochester (N. Y.) Engineering Society; C. W. Raymond, First Vice-President; A. S. Crocker, Second Vice-President; William J. Stewart, Treasurer, and John F. Skinner, Secretary.

Gross, E. Z., Mayor of Harrisburg, Pa., was presented with a Christmas gift by Col. James B. Hutchinson, Chief of Police of the city, on behalf of the members of his department, in the form of a picture, nearly five feet square, in an eight-inch gilt frame, which contained a picture of the Mayor and Chief and individual photographs of every member of the force and employee in the Police Department.

Hopkins, Henry, City Lamp Inspector of New Haven, Conn., since 1895, who was a member of the Illuminating Engineering Society of New York, and who was an acknowledged authority on lighting matters, died recently in the forty-ninth year of his age.

Innes, H. C., has been elected President of the Engineers' Club of Cincinnati, Ohio; F. M. Crocker, Vice-President; E. A. Gast, Secretary and Treasurer; A. W. Owen, Adam Ritter and E. H. Berry, Directors.

Kendrick, Julian, has been reelected City Engineer of Birmingham, Ala.; J. C. Murray, City Clerk; John M. McCartin, Street Commissioner; W. H. Abernathy, Electrical Inspector; A. V. Bennett, Chief of the Fire Department; J. P. Lind, Building Inspector, and E. D. Smith, City Attorney.

Lindner, A. L., General Manager of the Citizen's Railway and Light Company, of Muscatine, Ia., who has had control of the property for three years, during which the business doubled, severed his connection with the company January 1.

MacLeod, George, of Versailles, Ky., Assistant Engineer of the Central Kentucky Traction Company, has been appointed Chief Engineer and Assistant General Manager of the Lexington Interurban Railways Company, succeeding William R. Allen, of Lexington, Ky., who resigned to accept a position in Norfolk, Va.

McClelland, L. F., a prominent young lawyer, has been elected Mayor of Stone Mountain, Ga., succeeding I. N. Nash.

Newell, F. H., Chief Engineer of the U. S. Reclamation Service, has been elected President of the Washington Society of Engineers, succeeding Col. John Biddle, Engineer Commissioner of the District of Columbia; O. H. Tittman, Vice-President; L. D. Bliss, Secretary, and D. E. McComb, Treasurer.

Owens, Terence F., Chief of the Fire Department of Denver, Col., who has taken part in every fire in Denver since it has been a city, has been retired on half pay pension.

Parsons, Edgar, Assistant City Engineer of Springfield, Ohio, has resigned, and President A. J. Moyer, of the Board of Public Service, has announced that a successor will be appointed early in 1907.

Pew, Arthur, of Atlanta, Ga., Consulting Engineer, has been engaged to prepare plans for a sewerage system for Quincy, Fla.

Pierson, George H., Consulting Engineer of New York City, has been engaged to design a sewage disposal plant and superintend the construction of five miles of sewers in Greenville, Pa.

Pollock, Clarence D., has been elected President of the Brooklyn Engineers' Club; Kingsley L. Martin, Vice-President; Joseph Strachan, Secretary; John Middleton, Treasurer; James Meem and E. C. Shaler, Directors.

Russell, Captain Benjamin R., the oldest active fireman in North Carolina, having been for thirty-one years a member of the volunteer and paid Fire Departments of Wilmington, passed away recently, when within three days of three score and ten years.

Sanne, Oscar, has been appointed Structural Iron Designer in the Bridge Department of Chicago, Ill.

Skene, Frederick, who, on January 1, succeeded Henry A. Van Alstyne as State Engineer and Surveyor of New York, was recently tendered a dinner by his associates and subordinates in the Engineering Corps of the Department of Public Works of the Borough of Queens.

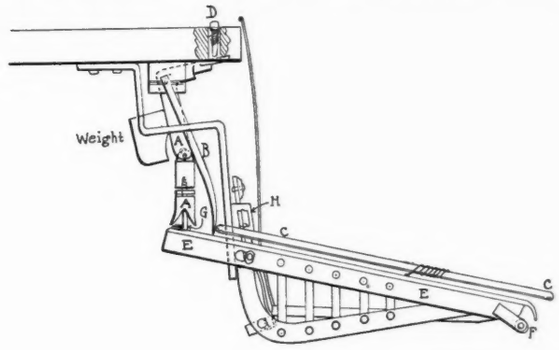
A PAVING AND BUILDING BLOCK PLANT

The United Brick Company was formed by citizens of Conneaut, Ohio, in 1905. The directors are prominent and successful local business men. The management is in charge of Mr. F. B. Dunn, who has been actively engaged in clay working in all its branches for the past thirteen years, having been a successful machinist in building clay-working machinery, and also an employee in a brick plant; which experience has given him a thorough knowledge of brick making. Mr. N. C. Ralph, formerly in business in Pittsburg, Pa., is a director and secretary of the company. The company purchased the plant of the Harper-Norton Shale Brick Company, which was a modern one, having been built only five or six years, and spent a large sum in making it thoroughly up to date and in extending the facilities. They have, adjacent to their plant, an almost unlimited supply of shale, which lies in a bank sixty feet above their yard. Copies of the analysis of this are furnished to those interested.

The shipping facilities are unusually good. The plant is located on the western bank of the Conneaut river immediately adjoining the property of the Dock Company at Conneaut Harbor. The main line of the Bessemer & Lake Erie Railroad, operated by the United States Steel Corporation and extending from Conneaut Harbor to Pittsburg, Pa., runs through their property. The car ferry between Conneaut Harbor and Ports Rondeau, Stanley and Dover in Canada, afford shipping facilities to Canadian points. The main line of the Lake Shore and Michigan Southern Railway adjoins their property on the north and the Nickel Plate Railroad parallels it on the south. These two trunk lines furnish unexcelled facilities for shipping east or west. No delays are experienced in securing cars. Brick from this plant has been used in the home town, a number of miles of streets having been paved with it during the past five years. The company says the town officials are pleased with it, but the new product is claimed to be far superior even to the old. Shipments have been made during the last season to a number of other cities also.

STREET CAR FENDER

At a recent trial of street car fenders at Newton, Mass., in the presence of the Massachusetts Railroad Commissioners, an invention of Mr. William Picket, of Lynn, Mass., an employee of the General Electric Company, attracted favorable attention. The fender consists of a cradle attached to suspending braces by two lugs, H.

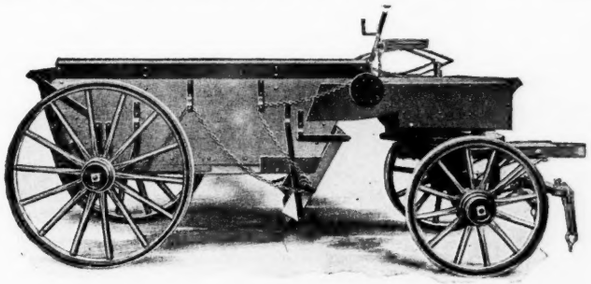


SIDE VIEW

An adjustable toggle joint A holds the basket at an elevation of from two to twelve inches above the track. In operation, an obstacle strikes the automatic trip C, breaking the toggle joint, or the motorman presses his foot on the pin D with the same result, the fender frame drops and rests on the track at the roller E. When desired the fender on the rear end of the car may be raised to position nearly vertical, and locked automatically against the end of the car. The claims made for this device are absolute reliability of drop and certainty of picking up the obstacle, provided the latter be a human body or any object of similar weight or size. On the occasion of the test referred to the Picket device picked up a dummy, arm first, and rolled it over into the cradle, without injury to dummy or fender.

DUMPING AND SPREADING WAGON

A DUMPING wagon with some peculiar features differing from ordinary wagon of this class is that manufactured by the Henry M. Glen Wagon Company, Seneca Falls, N. Y. The peculiarity of construction consists in the manner of hanging the doors, which, instead of opening outward from middle line on hinges attached to the sideboards, are hung from swing straps on the sides so that one door moves forward and the other to the rear rising to such a height as to be wholly above the bottom of the wagon bed. These wagons are strongly ironed with wrought iron and have a short wheelbase of 8 foot 1 inch which makes them compact and of easy draft. Large pulleys on the winding arbor allow quick work in closing the doors. The box is lapped over all around and the doors close with a 2-inch lap. The advantage claimed for this wagon is the method in which it delivers the material with which it is loaded, either spreading the material through the opening between the doors, which is regulated at will, or dumping the whole load at once freely so that it is spread in all directions entirely free from the doors, which have been elevated.



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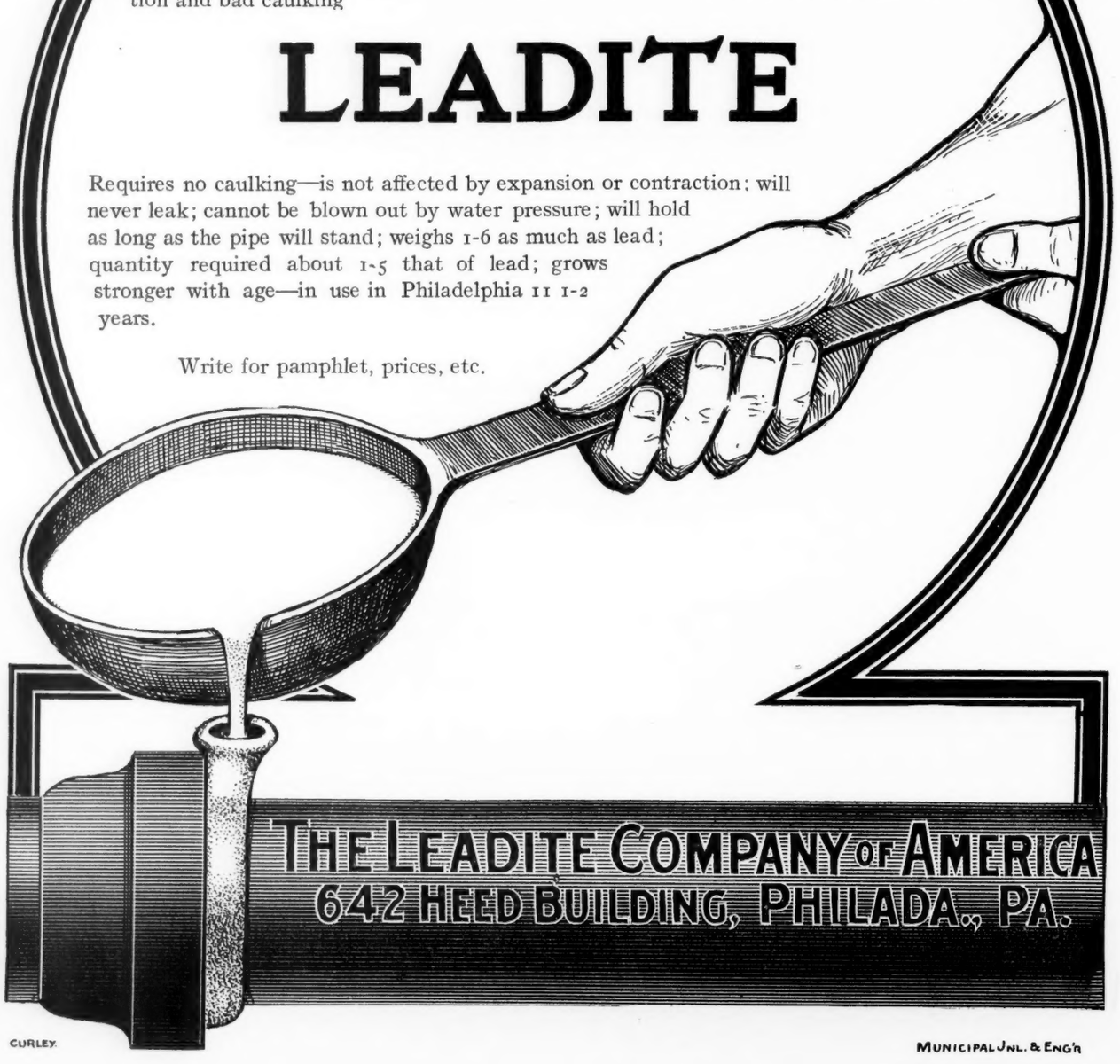

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